60 LATEST AIR WAR PHOTOS
FLYING
AND POPULAR AVIATION
MARCH
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CHNOLOGY DE
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s Issue
★ JAMES R. YOUNG ★ Col. JOHN H. JOUETT
CY CALDWELL ★ Congressman JENNINGS RANDOLPH

WHAT THAT ENDURES
CAN A FATHER GIVE HIS CHILD?

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—A calm perspective. Knowing the world from above it, your boy or girl could never again be as hurt by its pettiness.

—The surge of power that comes from far horizons, new perspectives, and intimacy with sunrise seen above clouds.

—The calm quiet mind of conquering a new element above.

—And a trade or profession tomorrow will acclaim.

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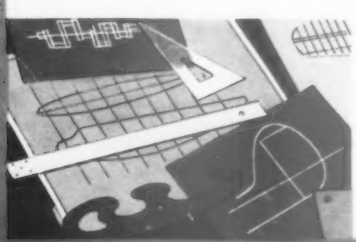

TAYLORCRAFT

TAYLORCRAFT AVIATION CORPORATION
ALLIANCE, OHIO

A Message from Oliver Parks . . .

TO YOU WHOSE INTEREST CENTERS ON AVIATION **January 8th, 1942**

Our Country is at war.

This tremendous fact overshadows all else. It dominates our thinking. It shapes our plans and directs our actions. Our individual freedom, which we want above everything to preserve, we willingly surrender for the time being for the good of the common cause. The question uppermost in the mind of every American is: "What can I do to best serve National Defense?"

Some of you believe you can be of greatest value in aviation; in helping to build and maintain adequate airpower. Certainly, the vital importance of this branch of the armed forces justifies your interest in it. It has been proven, not once only, but many times since September 1939, that a defensive action, either on land or sea, can be successful only when supported by superiority in the air. Too, we can be sure that when hostilities finally cease, the commercial branch of aviation will be called upon to play a major role in the restoration of a balanced peacetime economy.

But now the job is to "Keep 'Em Flying" in great numbers, in planes of superior design and performance, and in planes that are maintained in as near perfect condition as is humanly possible.

This is a job requiring men that are especially trained, and you will find, if you look about, that Parks graduates, hundreds of them, are helping to do it. Some, more than ten per cent, are themselves flying in the Air Corps or in the Naval Air Reserve. Others are helping to engineer still better planes, some are instructing Air Corps Aviation Cadets on the ground and in the air, and still others are maintaining and supervising the maintenance of military flight equipment. Since July 1939 practically one hundred per cent of Parks graduates entered at once upon work of strategic military importance. They are worth immeasurably more in National Defense than if they had offered themselves to the services, untrained.

Recognizing the overwhelming importance of aviation in National Defense, and realizing the urgent need for trained men in every department of it, we can conclude that the young man who enters upon an adequate course of training, giving his best effort to it, with the immediate objective of fitting himself into the Defense program, is doing all he can to promote national security. He is giving a good account of his American citizenship.

Oliver L. Parks

President
PARKS AIR COLLEGE

Oliver L. Parks
President

★ ★ ★ ★

PARKS AIR COLLEGE was founded August 1, 1927. Has enjoyed full Federal approval longer than any other aviation school.

Is accredited in its Aeronautical Engineering School by the Illinois Superintendent of Public Instruction.

Included in the Accredited Higher Institutions 1938 issued by the United States Office of Education, Federal Security Agency.

Graduates are qualified educationally for appointment as aviation cadets in the U. S. Army Air Corps and for flight training in the U. S. Naval Air Reserve.

Has a capacity enrollment of 325 commercial aviation students, and 216 U. S. Army Air Corps Aviation cadets.

Has its own airport with a school plant of 25 buildings devoted to school purposes entirely, also three fields of 568 acres, 155 acres, and 160 acres for military flight training.

Has a faculty of 82, each especially qualified for his particular field of instruction.

Open to high school graduates with a ranking in the upper two-thirds of their classes.

THERE is no better way to serve your country than by acquiring the specialized technical aviation knowledge which Parks training offers. In addition to this thorough technical training, Parks gives you a broad background of basic principles which equips you for leadership and responsibility in later life. As a thoroughly trained Parks graduate, you will be able to serve more effectively, more efficiently, in either commercial or military aviation . . . and prove to be an important factor in our most important line of defense.

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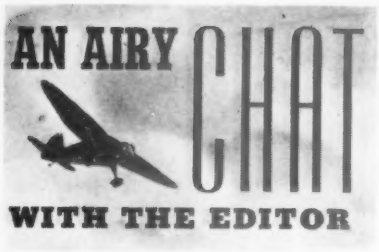

THE inevitable pessimists have been seeing Japanese generals in the White House ever since Pearl Harbor. The blunt, simple truth is that those Jap bombers caught our armed forces with their planes down—and no one realizes that fact any more than the Army and Navy themselves. It was a terrible defeat, as have been the battles of Wake, Midway, Guam and the Philippines. But the weakest snivelling little bully would appear a veritable giant if he could stab his most powerful enemies while they lay sleeping. American and British forces have been paying for their beauty sleeps since Pearl Harbor.

But pessimism is *not* the order of the day. Our air forces—though apparently outnumbered by heavy odds—already have proved their planes, pilots and equipment so far superior to that of the Jap that it hardly is worth the comparison. Our greatest weakness—it's our *only* weakness in the air—is numerical inferiority. Those of our readers who still think we're whipped can take our word for it that the tables will turn so fast that Japanese aviation will devote the rest of its activities from that time on to fighting a last-ditch defensive war.

Our air forces sorely needed heavy bombers and fighters in the Far East. We believe our Navy has been devoting much of recent efforts toward seeing that those aircraft get there. Even if whole squadrons of Army aircraft and their necessary supplies and maintenance equipment were ready to go on the morning of December 8 (we doubt that they were), it would have taken weeks to have gotten carrier-loads of these aircraft convoyed half-way around the world. Of course, the evidence now appears to be that those aircraft have arrived and are being based in the Netherlands Indies. At least, the number of Jap naval and aircraft casualties would indicate as much.

* * *

THE other day we got a letter from an Army pilot. It was a perfectly innocent letter. It was written in good faith and all that, but our good friend and reader made a mistake that might have been serious. On his letterhead he listed himself as a flying officer of a certain pursuit squadron of the Army and then, in the body of the letter, he pointed out in a nice friendly way that his squadron had been transferred to a certain strategic base outside the continental limits of the United States. For some time it has been our impression that such mail was censored; maybe he mailed it to us before he left for his new station. Nevertheless, our trusting reader slipped.

(*Continued on page* 121)

FLYING
AND POPULAR AVIATION
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Volume XXX Number 3

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DON'T BE STAMPEDED

in Making the Greatest Decision of Your Life!

Aviation has JOBS for thousands, but CAREERS only for trained men!

AMID the excitement and hysteria of a country newly at war, it is difficult to sit down calmly and make intelligent plans for the future, but never has it been more necessary to do so. Here are the salient points that should govern your decision: (1) This is a war of production. (2) Air power is bound to be a determining factor in its outcome. (3) Thousands of men are entering the back door of the aviation industry through cheap "quickie" courses that prepare them for single-phase jobs. BUT — (4) Only thoroughly trained men can fill the vital and well paid supervisory positions, and — most important of all to you, only these Career men can ever hope to retain these positions through the readjustments that must follow when America's production, now geared to war, shifts back to peace time schedules.

The executives who have made aviation THEIR career want men with the intelligence and sincerity to select aviation as a life work and to prepare themselves for it by proper training. They know that the value of each man is largely determined by the ability and experience of those who train him for his career. And they know that Curtiss-Wright Technical Institute graduates are — and for many years have been precisely trained to fill the industry's exacting requirements.

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It is imperative that before you invest in a course of career training you determine what the returns will be on your investment . . . for your choice of a school in which to take your training will determine how much money you will make all the rest of your life.

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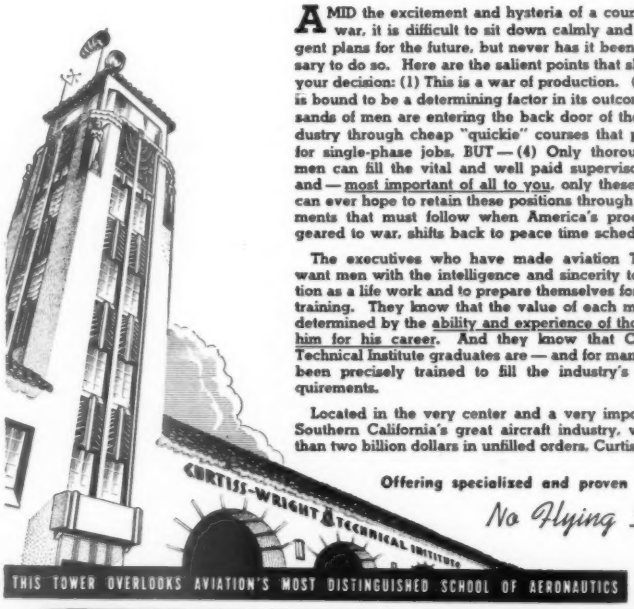
This school has never guaranteed positions for its graduates, but practically every graduate has obtained immediate employment as is advancing rapidly. The demand for our graduates far exceeds the supply, and we honestly believe that every student who enrolls here will be able to obtain, with our assistance, immediate employment upon graduation.

WARNING! — "Don't miss the boat." The greatest opportunity in your lifetime exists today! There never was such an opportunity in aviation for you; there may never be another. A position awaits you. Insure for yourself a steady income and independence for life. DON'T FOLLOW — LEAD! Send in your enrollment before you "miss the boat."



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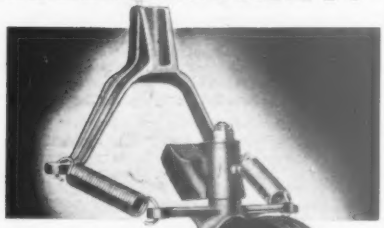

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Letters

Navy Issue

Sirs:

. . . I have greatly enjoyed reading this issue of your magazine, and believe that it is the best and most complete coverage that has been given Naval Aviation to date. In view of the present situation, your release date for this issue could not have been more timely.

A. D. FRASER
Lieutenant, U.S.N.
Bureau of Aeronautics
Washington, D. C.

Sirs:

. . . "I didn't think that it could be done—but you did it! The Naval Aviation issue is even better than the special Army issue—which was tops.

HAROLD HOLMES
Interstate Aircraft
and Engineering Corp.
El Segundo, Cal.

Sirs:

. . . Thank you for the specially bound copy of FLYING's big U.S. Navy issue. . . . We enjoy your aggressive spirit and as a result keep a 12-time contract with FLYING exclusively. . . . Keep up the fine aggressive work. We revel in it.

T. BOWRING WOODBURY
Vice President
Culver Aircraft Corp.
Wichita, Kans.

Sirs:

. . . I am sure I can quite freely say that . . . is the finest specialized issue of an aeronautical publication which has come to my attention to date.

A. D. PALMER, JR.
Director Public Relations
Curtiss-Wright Corp.
Buffalo, N. Y.

Sirs:

. . . It is a beautiful effort and will constitute a valuable addition to our reference library here.

J. H. DOOLITTLE
Lieutenant Colonel, Air Corps.
Detroit, Mich.

Sirs:

I want to take this occasion to congratulate you on the excellence of the January issue. I believe that you . . . have done an exceptional job of presenting the U.S. Navy aviation activities at their best.

DONALD H. CONNOLLY
Administrator
Civil Aeronautics
Washington, D. C.

Sirs:

Your January number is a "wow." Congratulations, and more power to you.

THOMAS H. BECK
Crowell-Collier Publishing Co.
New York, N. Y.

Sirs:

. . . It is certainly a fine presentation and anyone reading it should not be left in doubt as to the power of our Naval forces.

WALTER H. BEECH
Beech Aircraft Corp.
Wichita, Kans.

Sirs:

. . . The United States Naval Aviation issue of FLYING is one of the finest examples of magazine publishing I have ever seen.

O. W. TIMM
President
Timm Aircraft Corp.
Van Nuys, Cal.

Sirs:

. . . I think you have done a fine job in this issue as well as previous issues. . . . We look on FLYING as one of the best publications for the industry.

TED WELD
Vice President
Piper Aircraft Corp.
Lock Haven, Pa.

Sirs:

. . . This complete and authentic reference on the air power of the United States will undoubtedly prove a very valuable reference book on Naval aeronautics.

HAROLD E. WEBB
Sales Manager
Adel Precision Products Corp.
Burbank, Cal.

Sirs:

. . . This is a companion volume to the special U.S. Army Air Forces issue of last September and the two of them now provide an invaluable and interesting story of these critical important services.

HAROLD H. BURTON
Senator from Ohio
Washington, D. C.

Sirs:

. . . I believe this is one of the finest and most complete aviation issues dealing with one subject that I have ever had the pleasure of seeing.

MAX BOOKE
Assistant Secretary
Piper Aircraft Corp.
Lock Haven, Pa.

Sirs:

. . . I want to congratulate you on a fine and valuable work which, as a companion piece to your Army Air Forces issue, will make an important addition to my aeronautical library.

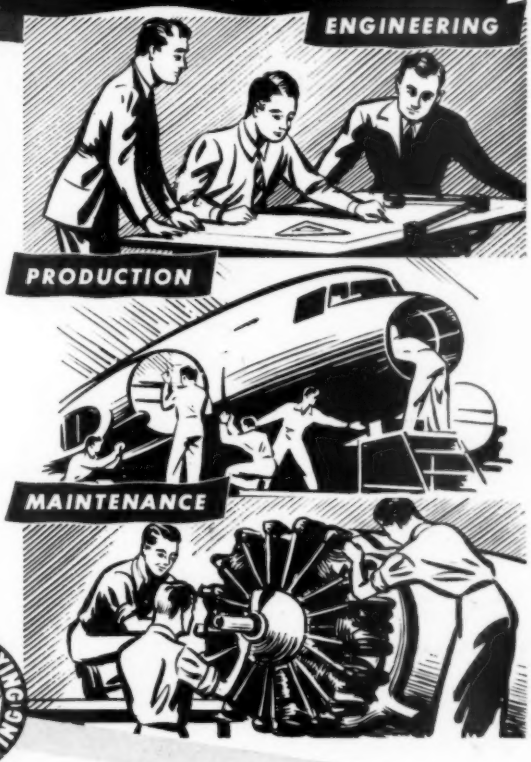
W. LAURENCE LEPAGE
Platt-LePage Aircraft Company
Eddystone, Pa.

(*Continued on page* 102)

Be Important To Your Country

...Through Training Vital To Your Future

America calls YOU to one of these branches of Aviation



Your interest in aviation must NOW be turned into ACTION. No longer can you say "Some day I'm going to get into aviation." That day has come! Victory for YOUR country demands YOU — an aviation-minded man who needs only training — training that will enable you to make a valuable, patriotic contribution to the most important thing in all our wartime production — more and more, and still more FIGHTING PLANES.

No matter what branch of aviation you are most interested in — a place is waiting for you there. And NOW you have the *never-again* opportunity to build a career on knowledge and ability that makes YOU important to your country in its relentless march to victory.

ALL of the immediate and future rewards of a position and a career in aviation are still yours. Aero I.T.I. will train you in a way that will serve your best interests, and your country's best interests, equally well. That you are assured of by the outstanding training programs supervised by the leading aviation executives identified with management and operation of Aero I.T.I.

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The Birdmen's Perch

We hope the snake story below doesn't scare any of the gals away. It tickles us when they send in taller tales than some of you male saga spinners. If it keeps up we may have to run a "Beauty Hints" column for them! Let's have some more, ladies.

Major Al Williams, alias "Tattered Wing Tips,"
Gulf Aviation Products Manager, Gulf Bldg., Pittsburgh, Pa.

THE FUNNYBONER DEPT.

Dear Major,

I suppose there must be a hundred versions of this story but I like my husband's best:

After years of wheel jobs we bought a pontoon-equipped ship. My husband had had only twenty minutes in the seaplane when we headed north on our annual hunting trip. After an uneventful few hours, we spotted our lodge and the landing strip which we'd built ourselves. My husband automatically dragged the field and swung around for an approach. We had less than thirty feet under us when I remembered the pontoons! "Stu!" I shrieked.

Somehow he sensed what I meant because he jammed the throttle open and got upstairs fast. Without another word between us, he headed for the lake, brought us down smoothly, and taxied up to our swimming float. We both sat there for a minute or two limp and damp. Finally he reached for his seat belt with shaking hands, undid it, and opened the door.

"Honest, I don't know how I could have done such a blankety-blank dumb, bonehead thing," he snarled as he stepped out into 16 feet of water!

Mrs. W. B. Stuart-Bullock
New York City

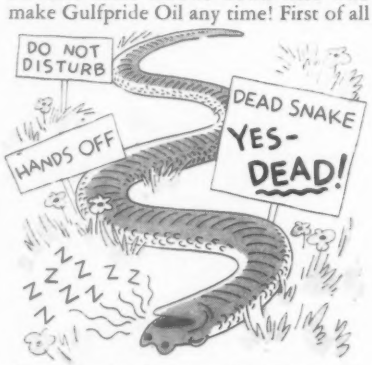
THIS MONTH'S BRAIN TWISTER

A railroad 350 miles long is built in a huge semi-circle. Two trains, one doing 30 m.p.h. and the other 40 m.p.h., start toward each other from opposite ends of the track. At the same time, a plane begins to fly back and forth between the trains at 100 m.p.h. (The pilot's a hot-shot and does his turns in nothing flat.) How far will the plane have flown by the time the trains meet? Robert Smith, who sent this one in from up in Hamilton, Ont., says it's as easy as pi.

STORY WITH A TWIST

Some of you Westerners are probably familiar with the hog-nosed snake. When he's frightened he blows himself up to twice his normal size. If that fails to scare away any enemies, why he plays dead. Just being dead isn't enough, though; he must be on his back to feel properly dead. And if you put him right side up he'll come to life long enough to roll over on his back again before resuming his "death." He's a perfectionist!

But when it comes to perfectionists, I'll take these fellows down here who make Gulfpride Oil any time! First of all



they demand choice crudes. Then they refine these crudes by a special method they developed because ordinary refining methods weren't *perfect enough* for them. This method (it's called Alchlor Process) gets *more* of the harmful carbon formers and sludge makers out of the oil. The result of this perfectionism is Gulfpride and you pilots who use it know how it adds to the efficiency of your power plants. If you *haven't* used it, try it and see how Gulfpride helps you get the last ounce of performance from your engine.

THIS MONTH'S WHOPPER

Dear Major,

I stopped by the airport a few days back and saw an old guy with a Model T trying to

get his jalopy started. Turned out he didn't have any gas. Fortunately everyone on the field was watching a "Stratoliner" take off, so I slipped into a hangar and drained a carburetor I found on an inspection table.

Well, I put the Gulf Aviation Gas (of course it was G.A.G.! That's the only kind we use on this field!) in the "T" and cranked her for the old guy. I guess the throttle must have stuck wide open because that Model T dug out so fast that the sudden shock of air against the windshield broke the glass. The engine wound up tight and before she'd gone 100 feet she started to climb right up into the air! You see, there were two new tires on the jalopy and the treads gave her a grip on the air. (This is now a military secret, as you probably know.)

Major, that engine was turning over so fast that it just naturally kept winding, even after the G.A.G. was used up. The old guy had to just sit tight and wait for the friction of the air to wear the treads off those new tires.

Finally that happened and when he touched the ground he was right smack in front of the Administration Building at La Guardia Field! But by that time the treads, tires, and rims had been worn from his wheels. Before he could brake that "T," he'd over-shot the field and plowed clean through Jamaica Bay with the spokes acting as waterwheels. (He sold the "T" to the Marines last week for a swamp-buggy and now *it's* a military secret!)

Furthermore, he beat the "Stratoliner" in by 15 minutes!

Truly yours,
Ray "Cotton" Kottenboch, Hollywood, Calif.

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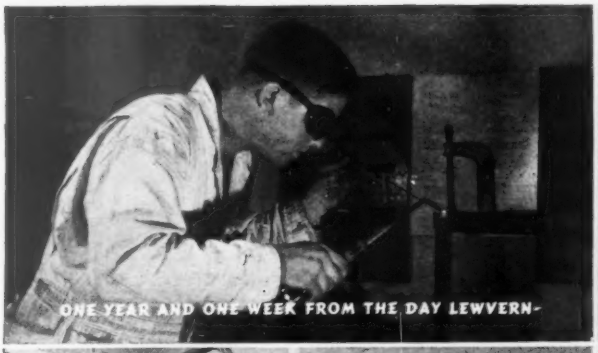
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PA-3-42

WAR IN THE AIR

All over the world the airplane was changing the course of civilization. Air power has proved itself the dominating factor in every major phase of modern warfare, on land as well as on sea.

A noted war correspondent with 13 years' service in Japan, Mr. Young gives a dramatic summary of America's position in the Battle of the Pacific. Pictures tell story of air war on all fronts.

By

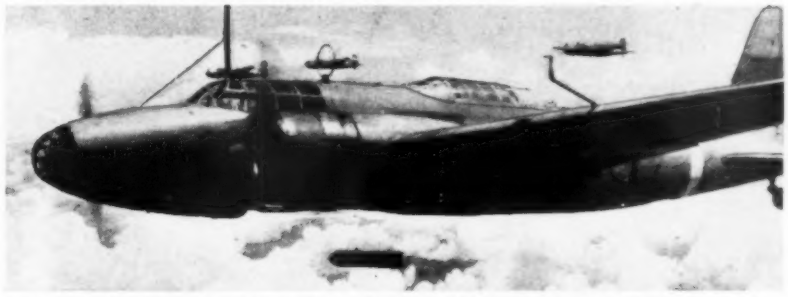
James R. Young

IN the American-Japanese battle of the Pacific, young pilots of the American squadrons protecting the Burma Road, under Col. Claire L. Chennault, 51, have brought down scores of Jap planes.

I repeat my statement in the December issue of FLYING, that Japan cannot withstand the highly developed and speedy striking ability of America's might. Japan will quickly crumble, with the same fast reverses as Adolph Hitler's overwhelming numbers and highly mechanized units suffered at the gates of Moscow and in the dramatic recapture of Rostov.

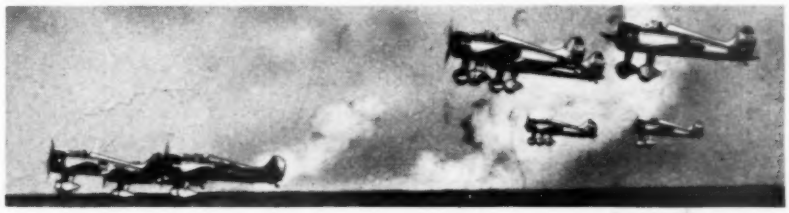
Japan faces: (1) America, the imponderable in air and sea power. (2) China, the imponderable in manpower and geographical area. (3) Russia, the imponderable bear which runs from Europe to Asia. And (4) the Pacific, an imponderable of 64,000,000 square miles.

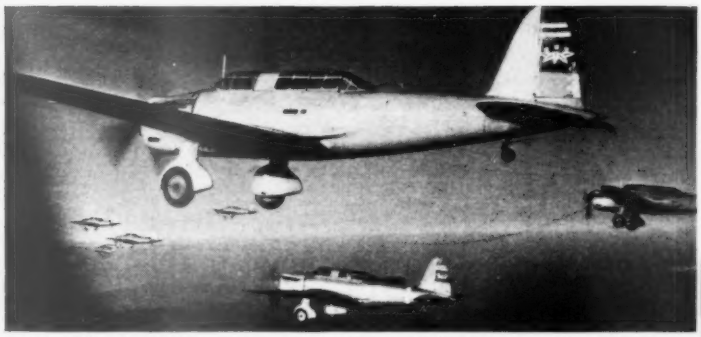
Facts face Japan, but her arrogant, stupid, fanatic militarists will not admit



A copy of the American Martin "166," this Army Mitsubishi 97 (built in 1937) is one of latest Jap types. With two 870 h.p. engines, range is 2,480 miles, top speed 224 m.p.h.

Jap Navy Nakajima 96-2 fighters below are striking copies of ancient U. S. Army Boeing P-26. They have 550 h.p. engines, are lightly armed, their top speed is 236 m.p.h.





Like all other Japanese aircraft, these Mitsubishi 98-1 Army bombers are copies. Similar to a Northrop design, these probably bombed Philippines.

Probably used in Hawaiian and Wake raids, Mitsubishi 96-2 Navy bombers are copies of Junkers. Two 950 h.p. engines are used; their range is 1,615 miles.

THE FAR EAST

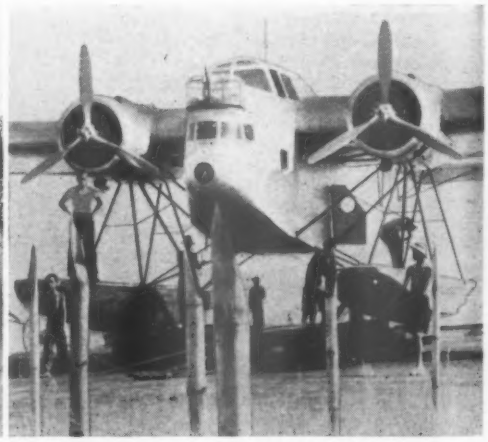
Though it is the newest of the wars, war in the Pacific already has done much to rewrite most of the preconceptions about aircraft vs. seapower.

These Jap airmen, planning an air raid, might well be considering U. S. targets when picture was taken.

This is one of the Jap dive bombers shot down at Pearl Harbor. Flap-like device on underside of wing back of leading edge is dive bombing "brake."

Score another kill for Navy gunners at Hawaii. This Jap fighter, hit in fuel tanks, dives flaming into the ocean.

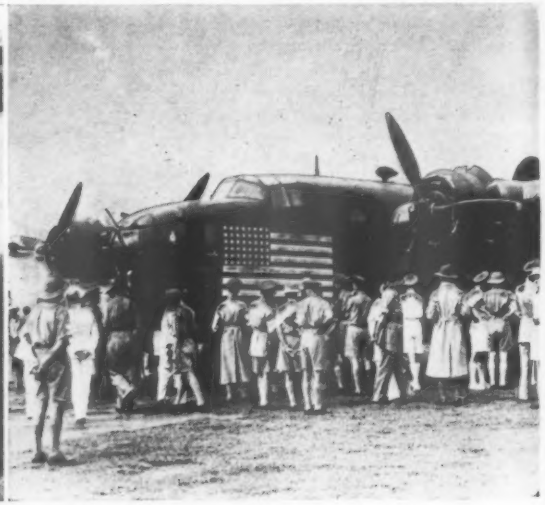
Dutch fighters battling Japs in Netherlands Indies include these old Curtiss pursuits, basically identical to U. S. Army P-36. They also have some Brewsters.



Old, but still fighting Japs, is Dutch Fokker T-4 seaplane. Note bamboo spears (foreground) to kill paratroops.

Taking heavy toll of Jap aircraft and shipping are these Australian Lockheed "Hudsons." Letters US on fuselages are just squadron marks.

This U. S. Army Consolidated B-24 was photographed at Singapore just before Japan attacked. It was on a world flight.



This burned and crumpled wreckage was all that remained of a Navy amphibian (probably a Grumman JRF-2) destroyed on the ramp at Wheeler Field, Hawaii, in first raid.

Maj. Paul A. Putnam, who commanded squadron of 12 Marine planes that defended Wake.

Planes and buildings go up in smoke at Hickam Field during first Jap raid. This B-17 "Flying Fortress" escaped undamaged.

Wreckage of a Hickam Field pursuit plane which was caught on the ground by Jap bombs. The ship was a Republic P-35.

that Nippon is *doomed*. I stated in a cable from Tokio to the New York office of the International News Service, exactly four and a half years ago when Japan opened her China campaign, that "FOREIGN MILITARY EXPERTS FORESEE AVIATION ANGLE WILL DETERMINE CONFLICT'S DURATION."

Time and events are substantiating that forecast, although with bitter irony, since the present Japanese air thrusts were made possible because we enabled them to get materials and gasoline in such increasing quantities that they could attack us at Pearl Harbor and Manila.

The stuffed shirts among State Department career men refused to believe the foreign correspondents who warned them of Japan's often-announced ambitions.

A day of reckoning will deal with those who cheapened and sabotaged American foreign policy.

Consider the wonderful showing of an underequipped and understaffed American front-line air staff in Asia. In four

Here's how Tokio, Japan's capital city, will look to attacking U. S. bomber crews.

RUSSIA

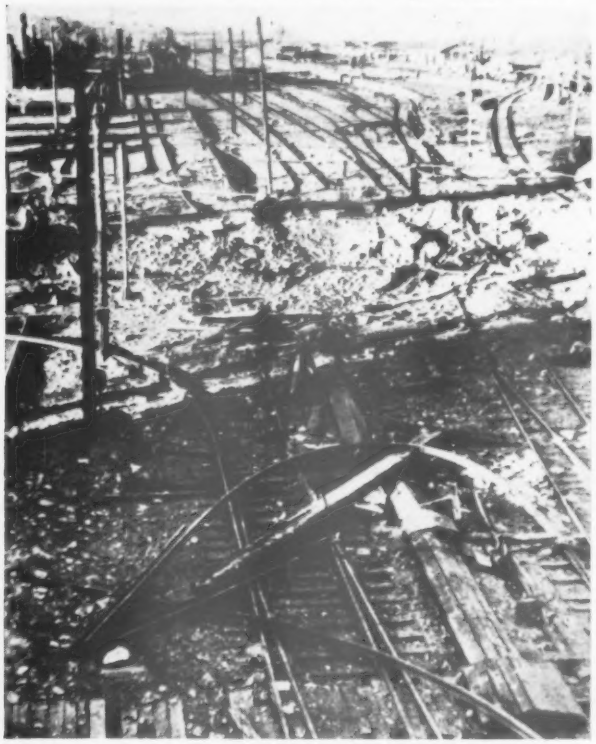
Hitler's air force was trying mightily to save the German army from a complete rout by the planes and guns of the highly capable Red air force.

A direct hit by antiaircraft downed this Russian heavy bomber. The Reds, however, continue flying in cold that grounds Germans.

Hundreds of dive-bombing Ju-88's were lost in Russia. This one attacked, unaware of the trailing Red fighter which shot it down.

This is one of the British eight-gun Hawker "Hurricanes" being supplied the Russian air force. Note four gun ports above wheel.

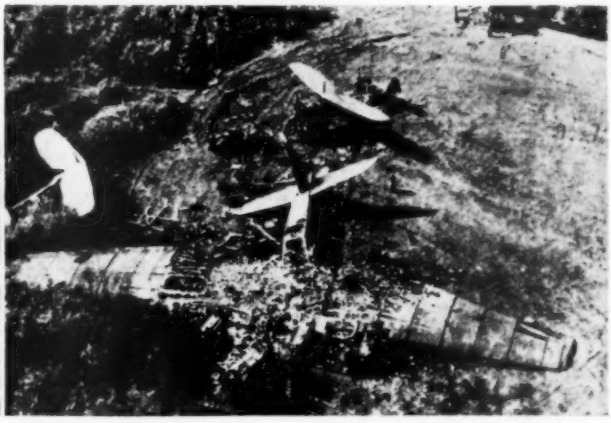
One German Junkers Ju-88 dive bomber wrecked this railroad junction near Leningrad. One bomb smashed eight separate tracks.



Latest Nazi Messerschmitt Me-109F's were rushed to the Russian front, but have suffered heavy losses in bitter sub-zero cold.

This picture, from Germany, shows a "graveyard" of shot-down Russian planes. Light bomber in foreground appears to be French design. In direct background is an SB bomber. Monoplane fighter at left is an I-16.

Probably a Russian "Stormovick," this dive bomber was shot down with bombs intact. Note armor plate behind pilot seat.



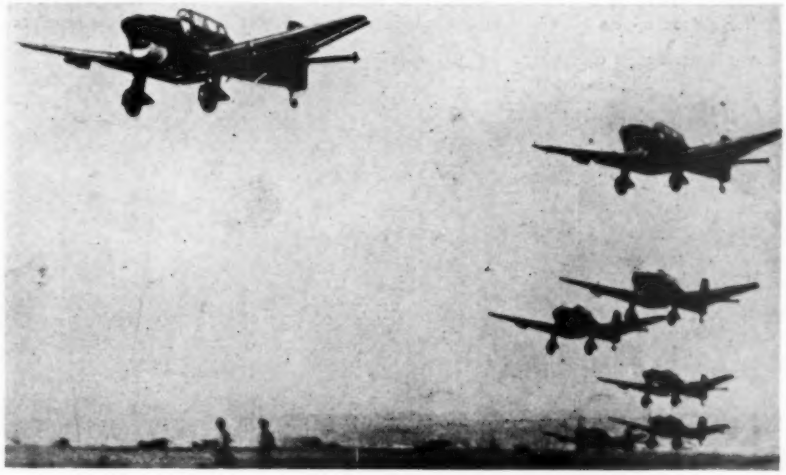
German pilots caught this four-engined Russian bomber at its home base. Nazi planes now using field are Henschel Hs-126's.

air battles on the Burma Road, the American volunteer flyers lost four planes and two pilots against 60 Japs brought down. Not in the five long, hard, unsuccessful years of the Chinese struggle—aided, of course, by a bunch of half-hearted cream puff diplomatic State Department appeasers—have the Japs undergone such punishment. All in a week!

On last Christmas day the Yanks brought down 16 Jap bombers and 12 fighters, for a total of 92 Nippo airmen. The week's grand total was 149 Japs lost. These vital and encouraging statistics are a barometer of what will happen to vulnerable Japan and to Japan's over-extended supply lines when American, British, Dutch and Russian battleships of the air leave their metal calling cards on the congested industrial areas of Tokio, Yokohama, Nagoya, Osaka and western Japan.

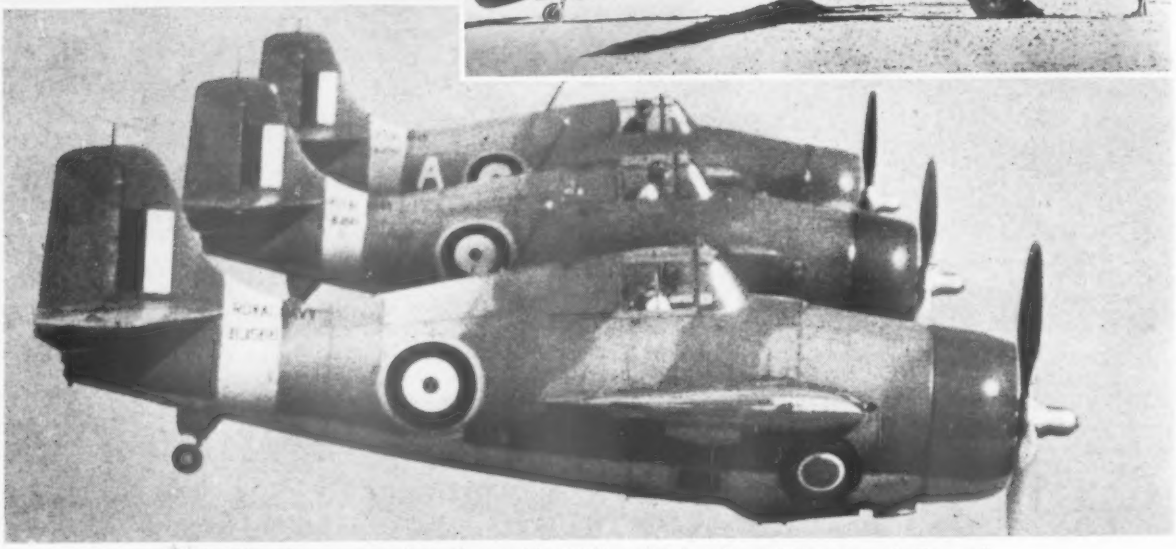
The Japs were using their very best men, who have been in the air a good

Off to raid Russian columns, these old Junkers Ju-87 "Stukas" are the easiest Nazi type to shoot down. Reports from Russia indicate that hundreds have been destroyed.

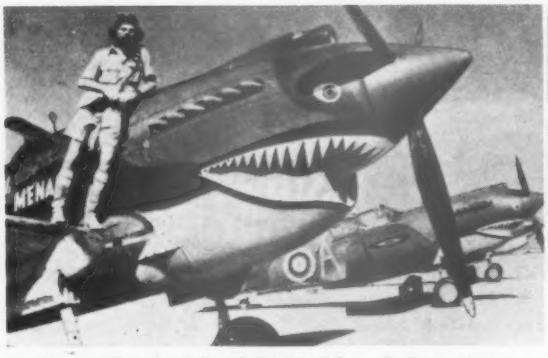


THE MIDDLE EAST

Over the hot African desert RAF warplanes, many of them American-built, were blasting retreating German tank and air forces to defeat.



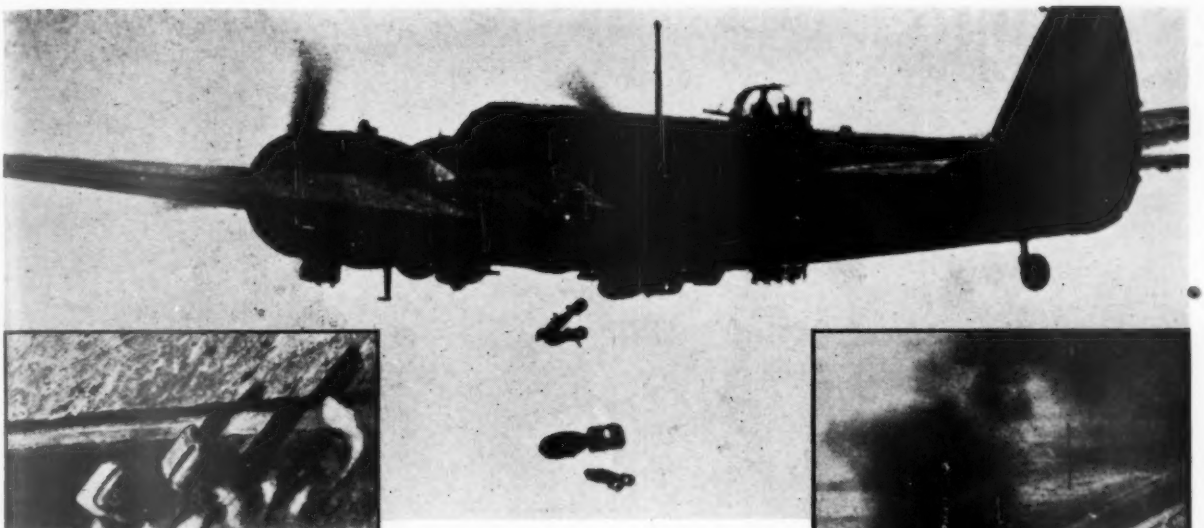
British African forces captured this German Me-110 (top photo) and used it for communication work. Above are American-built Grumman "Martlets" with Royal Navy's Air Arm flying in close formation.



Curtiss "Tomahawks" with RAF in Libya. Radiator design for Allison engine allowed artists to create shark head.

Now fitted out as a high-speed light bomber, RAF "Hurricane" is being used in desert as well as against German factories in France.

Torpedoed and sinking, Britain's "Ark Royal" took many aircraft down with her. Planes on bow are famed "Swordfish."



A Bristol "Blenheim" bomber of Middle East Command unloads its eggs over objective.

Two enemy lorries (left) careen off road during machine-gun attack by RAF planes.

Axis oil supplies in Libya go up in smoke (right) as RAF wreaks havoc on supply line.

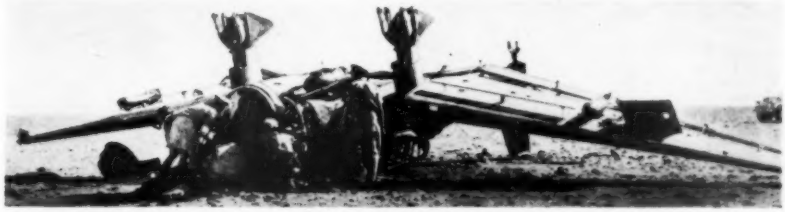
Crew of shot-down Italian Cant Z-506B bomber seaplane are saved by British destroyer they tried to sink.

Douglas "Boston III" lands on RAF field in Libya. Speedy and highly maneuverable, this American aircraft has earned plaudits of pilots.

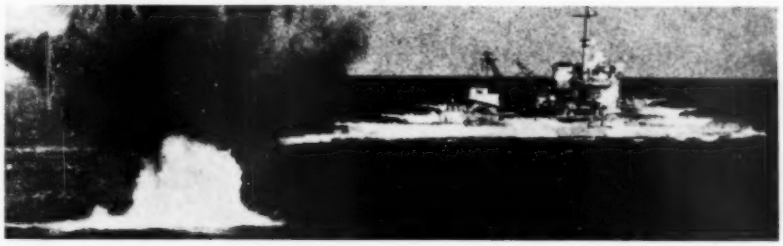
four years, against green young Americans. Some of the latter, from the Dakotas to Texas, were in their first combats.

Imagine the depressingly unfavorable psychological effect these results are having on Japan's recently reorganized air force under the notorious and arrogant Gen. Kenji Doihara, the Hermann Goering of Nippon. We demonstrated in just one week that, once we reach parity in the air, Japan will no longer have a long field to range. Japan's recent flights to North Australian islands will be hampered. Her flights to inland China will be shortened. The Yanks and the Dutch will be on the offensive, bombing Jap airfields in Thailand, occupied areas of China, the Jap island of Formosa, and Indo China, which are the springboards for Jap attacks on our defenses.

We will destroy Japan's concentrated industrial centers; one an area which furnishes 80 per cent of Japan's electric



Bombs still intact, this Junkers Ju-87 crashed behind British lines. Tires have already been removed by RAF salvage squad. HMS "Warspite" (below) has close call.



EUROPE

Fighting in Europe is confined almost entirely to aviation. British bombers have hammered both German and Italian Forces effectively.

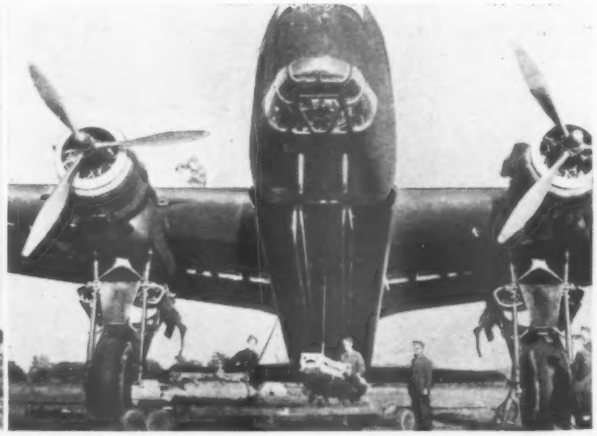
To overcome high submarine losses, the Germans have improvised a number of old Heinkel He-111K's as torpedo planes. Note second torpedo under fuselage.

While attacking a convoy, this Focke-Wulf "Kurier" was shot down by a "Hudson." Note swimming crew.

These RAF Bristol "Blenheims," flying at roof level, have just bombed factory at Locri, Italy.

Currently used by the Germans as an ambulance plane, this Focke-Wulf Fw-189 primarily is an army co-operation type. It carries four guns, radio, cameras.

Now in action with RAF, these Bell "Airacobras" are fitted with 20 mm. cannon instead of originally-designed U. S. 37 mm. gun.



One of the biggest RAF bombers is the new Short "Stirling." It is widely used over German and Italian cities. It carries 10 guns.

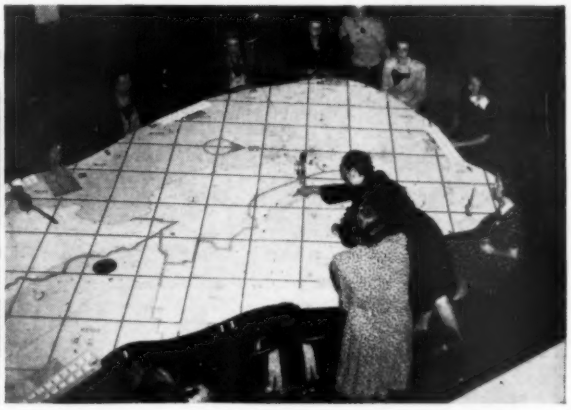
THE HOME FRONT

For Americans, at least, their new war will be fought largely in the factory. U. S. plane plants already are operating seven days per week.

Douglas A-24's, Army's equivalent of Navy's SBD-1, in mock attack on motor convoy "somewhere in America" as armed forces hold grim rehearsal for war.

Swift transport of heavy ordnance, such as 37 mm. antitank gun above, is Air Corps job.

Young Chinese flying students join RAF cadets at western U. S. training field. They will return to China for combat service.



Interceptor command plotting room traces movements of all planes in area. Army finds women good at this task.

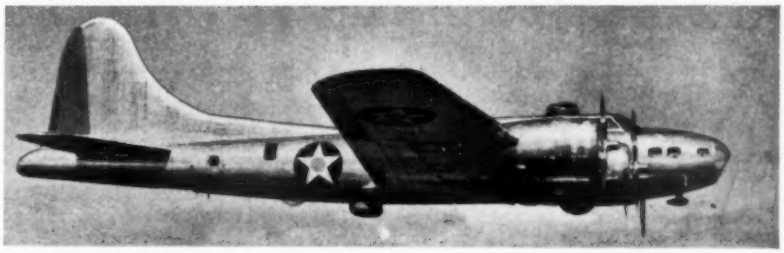
power; another a district which normally produces 60 per cent of all her war steel and armaments, as well as the highly centralized aircraft industry at Nagoya.

Japan's air power and material strength are no match for our modern bombers and 400 m.p.h. fighters. Japan cannot match our $10,000,000,000 Navy program, or the President's call for 60,000 planes in 1942. Every time Japan loses a capital ship, sub, cruiser, torpedo boat or airplane, she cannot make immediate replacements. Japan has gone in for an all-out war which, as Walter Winchell says, "will leave the Mikado not a ruler but the name for a pencil."

Here's a quick re-hash of the marvelous American showing:

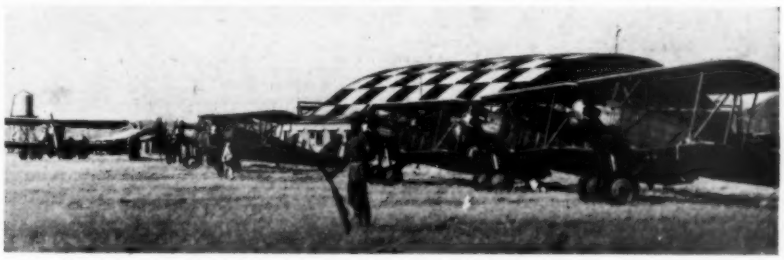
1. American sailors, victims of a Jap air attack on a small Philippine passenger freighter, said the Japs showed poor marksmanship and used considerable ammunition to sink the small vessel.

(*Continued on page* 60)



Much of U. S. heavy bomber program is based on deadly new Boeing B-17E "Fortress."

Old U. S. Vought "Corsairs" are used by Mexican air force to patrol Lower California.



WE'LL DO THE JOB!

To meet the production demand, aircraft companies are working night and day. Here is typical scene inside Lockheed's factory at night where 33,000 workers are turning out deadly P-38 interceptors.

by Col.
JOHN H. JOUETT
President, Aeronautical Chamber of Commerce.

Our aircraft industry must produce 60,000 warplanes this year and double that number in 1943. This expert asserts the job will be done.

WHEN President Roosevelt, in May of 1940, called for an annual production rate of 50,000 airplanes, the public gasped, but the American aircraft industry responded: "We can do it."

Last December, three days before Japanese bombs fell on Pearl Harbor, I was able to report in behalf of the industry that the previously announced annual production goal of 50,000 planes would be reached in 1942, as a result of expansion during 1940 and 1941.

So it is on a record of performance that the aircraft builders approach the new task assigned by the President—production stepped up to 60,000 planes in 1942 and 125,000 planes in 1943. While expanding capacity for the future, the industry tripled its 1940 output during 1941, and thus faces with confidence its future duties.

There is no overconfidence. It is understatement to call the task "difficult." There will be production slumps, snarls and setbacks. But with continued Government co-ordination of materials supply, with American labor providing the men and the women, with timesaving machines, and with the industry providing the experienced management there is every reason for confidence in our future production.

Men, machines, materials, management and morale are the ingredients of American production genius. They are the ingredients of airplanes, whether in quantities of 50,000 a year, 60,000 a year or 125,000 a year. We simply must have more—and still more—of everything.

How much more will it take to build 60,000 war planes in 1942?—more in a single year than the total production in the 33 years of American aviation? (From 1909 to January 1, 1942, nearly 58,000 war planes were built in this country). And how much more will it take to build 125,000 war planes in 1943?

The figures are staggering. They are no less staggering because they are estimates of requirements, which unquestionably will vary somewhat in accordance with ever-changing conditions.

A total of 60,000 planes in 1942 means 5,000 planes a month—or one plane every eight minutes of a 24-hour day! And a total of 125,000 planes in 1943 calls for one unit every four minutes of a 24-hour day.

That calls for manpower and, with increasing urgency in view of Army and Navy recruitment of men in the 20's and 30's, for womanpower. Two years ago, in January, 1940, the airplane, engine and propeller manufacturers (excluding thousands of accessory makers and subcontractors) employed less than 90,000 workers. As of January, 1942, this employment had risen fivefold to more than 425,000 workers. To produce at the rate of 60,000 annually, the American airplane, engine and propeller companies may need approximately 700,000 men and women. And 1943's goal of 125,000 planes a year

would call for approximately 1,700,000 workers. A longer work week would reduce the necessary number of workers.

What about the plants where these workmen are to turn out planes called for by President Roosevelt? Two years ago, in January, 1940, the aircraft builders had 13,000,000 square feet of floor space, which was greatly increased by January, 1942. The floor space required to build 60,000 planes in 1942 is estimated at 81,000,000 square feet. To build 125,000 planes may require as much as 189,000,000 square feet (equal to 1,350 city blocks), although development of increasingly efficient production methods —getting more pounds production per unit of production space—undoubtedly will reduce these requirements.

It takes approximately 10,000 man hours to build a standard type pursuit plane and 100,000 man hours to build a four-engined bomber. With sleeves rolled higher, working in shifts around the clock, the aircraft workmen will contribute pyramiding man hours to meet the President's plane quota. It has been estimated that 60,000 airplanes in 1942 will require 150,000,000 man hours a month or nearly 2,000,000,000 man hours during the year. In 1943, monthly man hours may be increased to 335,000,000, or more than 4,000,000,000 man hours for the year.

For these hours of work, industry will provide a tremendous payroll. Contributing to national income, aircraft, engine and propeller plant payrolls have increased fivefold to approximately $15,000,000 a week between January, 1940, and January, 1942. If wage factors remained constant, payrolls might increase to $30,000,000 weekly sometime during 1942 and $65,000,000 weekly sometime during 1943, to meet the annual schedules of 60,000 and 125,000 planes during these years.

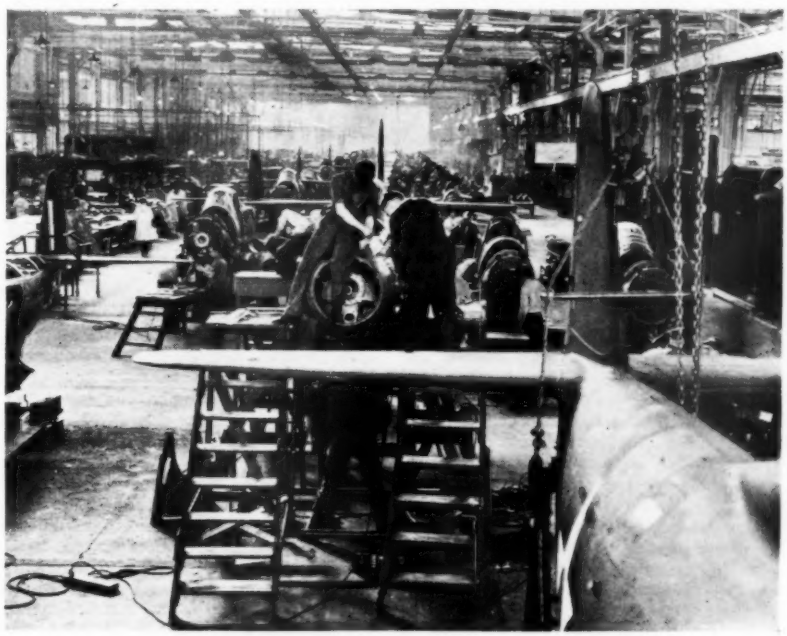
Such stratosphere figures are, of course, speculative and are significant only as indicative of the enormity of the job we are going to do. Of greater immediate importance are questions of where we are going to get the men, the materials, the parts and how we are going to use them for maximum results. Since the war began in Europe two and one-half years ago, the aircraft industry has been building planes and something more. That "something more" has been plant capacity to build planes in ever increasing numbers. So the tremendously expanded program finds the industry with substantial resources of plant capacity, available for maximum use when the men and the materials are available.

Where shall we look for manpower? The supply of labor in some places has been nearly exhausted and the aircraft manufacturers, in co-operation with Governmental agencies and public and private schools have been training unskilled workers. That training program will be expanded to the limit, heading up under the National Labor Supply Committee. An important part of the program will witness the training of over-age men and men deferred from military service because of physical inadequacies. Much of the work in aircraft production is suitable for women, and women may well play an important part in bringing production to full strength. A recent public opinion poll found that 68 per cent of the public favored drafting women between the ages of 21 and 35 for war work training. Women were more enthusiastic supporters of the proposal than men, voting 73 per cent for such a draft, as against a 63 per cent favoring vote on the part of the men. And the women who would be personally affected, the group between 21 and 35, voted 75 per cent in favor of training for defense plant work. There are substantial numbers of women workers in the aircraft industry now, but that number will be dwarfed by the tens of thousands who join the production army.

Speedy production of fighters is evidenced here at Curtiss' Buffalo plant. These are P-40's now in action with U. S. forces and RAF in China, Hawaii, Australia and Africa.

Meanwhile, the swift—since December 7—transition of American industry from consumers' goods to war materials has opened an important source of manpower. The most important factor in this is, obviously, the automobile industry, but

Youngest U. S. warplane manufacturer, but holder of one of the biggest fighter orders is the Bell Aircraft Corp. These are famous cannon-equipped "Airacobras" in production.



Production at the Lockheed plant, Burbank, Cal., has reached such a high peak that these P-38's are being assembled out-of-doors because of need for factory space.

there are other fields. Restricted or suspended production of refrigerators, radios and a host of other articles will divert craftsmen to war industries, including aircraft manufacture. The automobile manufacturers have been at work for some time on aviation orders—engines, sub-assemblies and, in one instance, the planned production of completed bombers. With the temporary suspension and continuing restriction of automobile manufacture for civilian use, the automobile industry will take on important new aviation assignments. But in the changeover period between automobile and aircraft production, tens of thousands of craftsmen will need work—and will find it in the aviation plants. The high percentage of skilled and semi-skilled workmen in the automobile industry is a significant asset for the plane program. In one automobile plant employing 80,000 men, for example, 34 per cent are machinists and machine operators, both vitally needed in the expanded aircraft program.

From manpower, the aircraft industry in its appraisal of the job it must do turns to materials, parts, sub-assemblies, accessories and the like. The American airplane is really an all-American product. Into it go materials, parts and equipment from each of the 48 states. The major plane, engine and propeller plants, are focal points for supply lines which radiate to every corner of the country. Abrasives from Arkansas, cotton from Mississippi and gypsum from Wyoming join with the stream of a thousand and one other articles pouring in unfabricated or manufactured form into the aircraft, engine and propeller plants. Thousands of corporations form the ranks of suppliers and subcontractors of the aircraft industry. Thousands more will join the ranks, as their productive facilities are turned from civilian products to participation in the 185,000 airplane program.

Subcontracting and careful organization of material procurement have been standard practice in the aircraft industry for years, but assume critical importance now. The airplane plant cannot produce at capacity unless all sources of supply and subcontracting feed in the materials, sub-assemblies and the rest at maximum speed. Two years of educational work by the aircraft manufacturers among the automobile builders and other sub-assembly sources, and among the material and parts suppliers, now will stand the nation in good stead. Procedures have been carefully organized in an effort to make certain that raw stock is on hand when needed, that machine tools are ordered far in advance, that subcontractors have adequate supply sources, and a host of other tasks in the supply process. A big bomber can be held on the ground by the absence of a tiny gadget just as certainly as by the absence of propellers.

Along with manpower and material, the aircraft industry in tackling its expanded job will continue its concentration on methods. During the last year a miraculous transformation has taken place in what was once—necessarily because of small volume—a "custom" building process. This was accomplished not so much by borrowing the methods of other industries as by creation and adaptation of quantity production processes suited to an industry which must build perhaps the most delicate yet the most powerful of all precision machines—the military airplane. These machines must travel at speeds undreamed of for other vehicles, even though they may weigh up to 80 tons. They must undergo tremendous stresses, yet be composed of the lightest possible materials. The aircraft builders had to meet these requirements and still slash time to a minimum. They have done so through advanced production methods.

In the old days the workers followed the airplane along the assembly line, building the ship step by step, from the first small sub-assembly to the finished product. It was a good method—the method of master craftsmen—but it was slow. Now, the airplane comes to the worker. The moving assembly line is standard in the nation's aircraft factories. Jigs, where the sections of the fuselages are put together, move on wheels. Entire airplane sections roll toward final assembly on overhead conveyor systems or conveyor tracks. Plants are designed to prevent "back-tracking" and sub-assembly lines are arranged to flow smoothly into final assembly.

New, time-saving machines have been developed to meet the quickened pace of the assembly lines. Hydraulic presses have grown larger. Machine tools have been developed. Riveting processes have been revolutionized. Reproduction of template patterns has become a matter of minutes, instead of hours. These are merely examples of speeded production methods now in use—when "time is short."

Quantity production methods are being facilitated by concentration on a reasonably limited number of types—the bombers, pursuits and other types proven best by war experience and strategically most important in the military plans of America and her allies. This does not mean that research and experimentation are being neglected. They are being given great attention, in order that American airplanes shall continue to fly faster, farther and higher and carry the best armor and armament, in comparison with the military aircraft of the Axis nations. But quantity production is concentrating on two types of four-motored heavy land bombers, two or three types of flying boats; three types of medium and attack bombers and a limited number of pursuit, dive bomber and torpedo bomber types. The President's order for 185,000 planes in two years, 145,000 of these to be combat craft, emphasizes the necessity of concentration on "production models."

Pooling has taken on new significance, in view of our airplane program. The aircraft industry pioneered in this process and is developing it rapidly. Because the Allies needed a Douglas attack bomber model in quantity, quickly, Boeing long ago built DB-7s. Now Douglas and Vega are pooling their facilities to build the most important Boeing B-17E *Flying Fortresses*. Production of Consolidated B-24 heavy bombers is being speeded through two huge Government-owned plants in the midwest—one operated by Consolidated, one by Douglas. The automobile industry, in turn, throws into this pooling process vast facilities for sub-assemblies. Ford, for example, will supply sub-assemblies for the two midwest plants operated by Consolidated and Douglas, while building completed B-24 bombers in a third plant. In the medium bomber program, General Motors and Chrysler will provide sub-as-

(*Continued on page* 73)

FOR IDENTIFICATION

Japan.

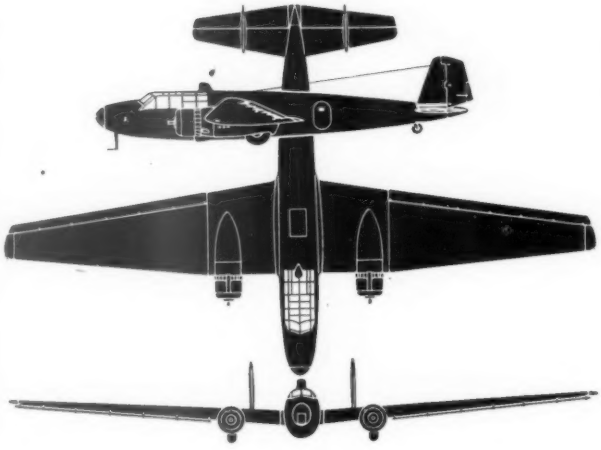
Germany.

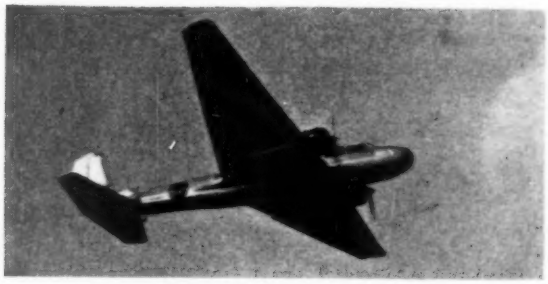
Italy.

AIRCRAFT silhouettes are vitally important to the national defense effort because they afford the only practical means of familiarizing the majority of our armed forces, as well as the public, with the appearance not only of American aircraft, but especially with those of the enemy. To date, the only authentic silhouettes that have appeared generally in the United States were those in the Army and Navy issues of FLYING, and in British aviation magazines reaching this country. In the past our armed forces have made wide, exclusive use of these few sources. Although the science of silhouette production is new to the U. S., British publications like The Aeroplane (from whom we borrowed the Junkers and Breda drawings on the following page), have done much pioneering in this field. With the cooperation of British aviation publications, the Air Ministry and our own armed forces, FLYING intends establishing "For Identification" as a regular feature of this and future issues. For clarity of identification, small symbols like those at left will be used to indicate the nationality of each aircraft.

MITSUBISHI Navy Type 96 (1936)

Long-range landplane bomber



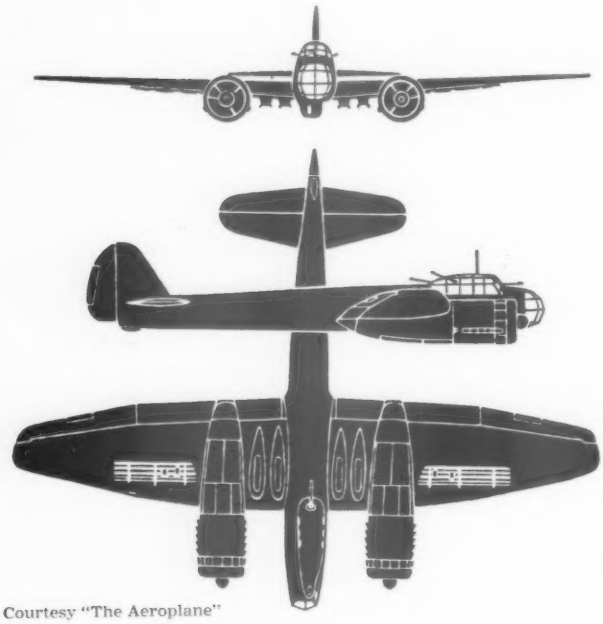


PERTINENT FACTS: A standard Japanese heavy bomber, the Mitsubishi 96 has been widely used against the Chinese and, recently, at Hawaii and the Philippines. A somewhat conventional low-winged, twin-engined monoplane, it basically is copied from German Junkers designs. Wing span is 82 feet, height, 12 ft. 1½ in.; gross weight is 11,000 pounds. Its two 950 h.p. air-cooled Mitsubishi *Kinsei* engines give it a reported top speed of 192 m.p.h. and range of 1,615 miles. A commercial version of this bomber visited the United States a few years ago on a good-will tour.

WHAT TO LOOK FOR: Long ailerons, extending from wing tips to center section, are typically of Junkers design; they hang somewhat below the wing, making it possible to see daylight between the aileron and wing. The wing itself has slight leading-edge taper, though the trailing edge of both the wing and center section has marked taper. Landing gear is semi-retractable, with the wheels projecting below the engine nacelles in their retracted position. The small projection atop the fuselage at the rear of the cockpit apparently is a shielded radio antenna.

JUNKERS Ju-88

Twin-engined low-wing monoplane dive bomber



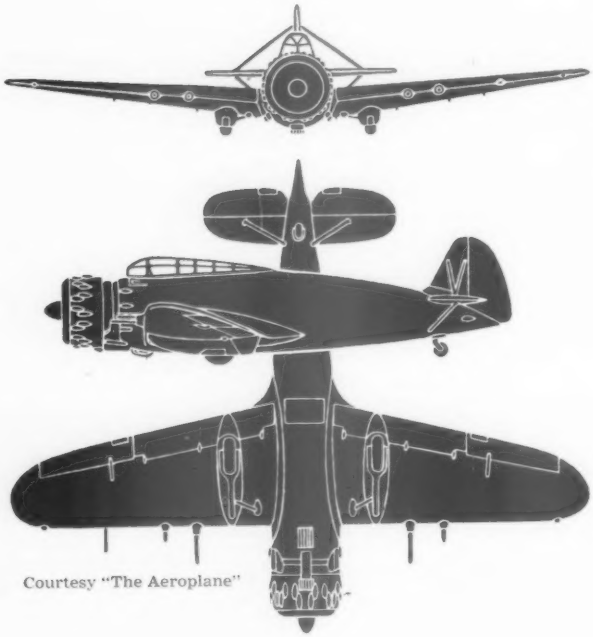
Courtesy "The Aeroplane"

PERTINENT FACTS: Successor to Germany's much-publicized Stuka (Junkers Ju-87), the Ju-88 has been handling dive-bombing assignments over England and in Russia. Powered with two 1,200 h.p. liquid-cooled engines, the Ju-88 has a top speed of approximately 320 m.p.h. Wing span is 59 feet, length 46 ft. 6 in., gross weight 25,000 pounds. Several Ju-88's, shot down over England, have been repaired and now are being flown experimentally by the RAF.

WHAT TO LOOK FOR: The long, slender fuselage and bulky appearance of engines and cockpit give the Ju-88 the appearance of being nose-heavy. The engines are pronouncedly underslung, project quite a distance ahead of the wing and, although they are liquid-cooled, are cowled to look like air-cooled radials. The current version has a gun-carrying bulge on the underside of the fuselage directly under the cockpit. This bulge is built off-center on the fuselage. Also distinctive are the compound taper of the wing, the unusual latticed flaps under the outer wing panels for slowing steep dives, and fully-retracted landing gear in the engine nacelles.

BREDA 65

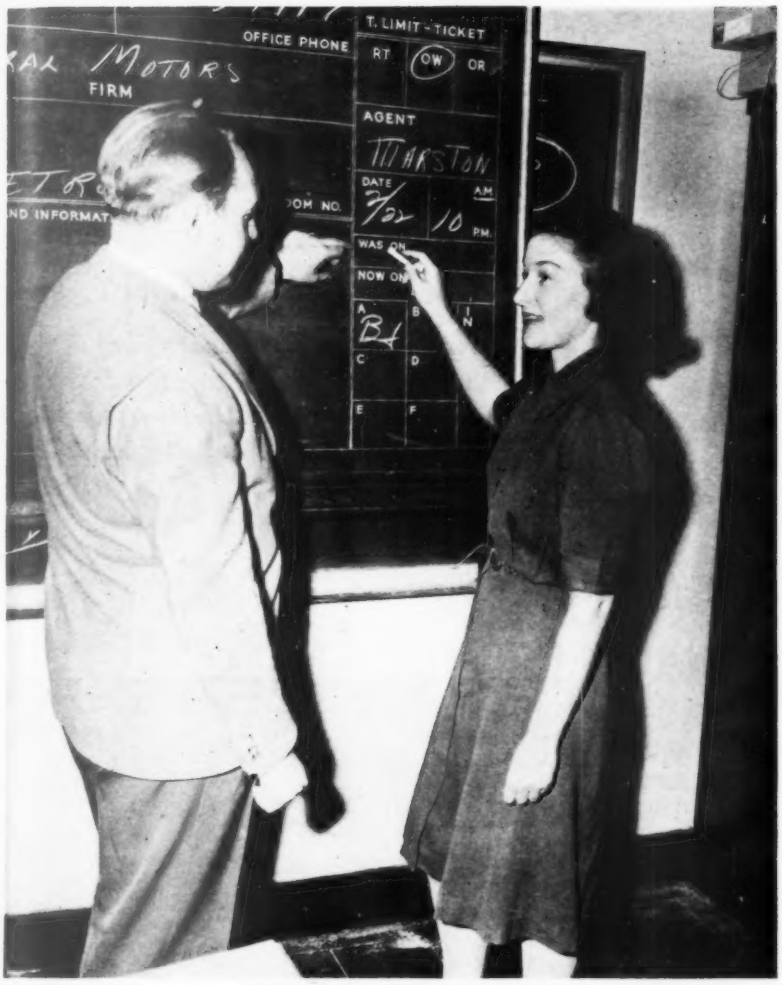
Fighter—Light Bomber



Courtesy "The Aeroplane"

PERTINENT FACTS: Following the practice established by such American types as the Army's Northrop A-17A attack plane, this Italian counterpart is a semi-streamlined low-wing monoplane powered with a 1,000 h.p. air-cooled radial engine. Top speed is in the vicinity of 300 m.p.h. One of the later types used by the Italians, the Breda 65 ordinarily is a single-place aircraft, although it can be converted to a two-place. As a fighter-bomber it carries several small bombs on racks beneath the wing. Span is 39 ft. 8 in., length 31 ft. 6 in., and height, 10 ft. 11 in. Its range is less than 1,000 miles.

WHAT TO LOOK FOR: Resembling at least one old U. S. Army attack type, the Breda 65 has a chunky, knobby appearance. Two of the four machine guns protrude markedly from the straight leading edge (the trailing edge has pronounced taper). External bracing on the vertical and horizontal stabilizers is noticeable. A closer view causes one to notice streamlining bulges on the engine cowl, where the cowl fits around cylinder heads. The landing gear is about three-fourths retractable, though the wheels protrude noticeably when retracted.



The many types of clerical jobs require schooling. Here a future reservations clerk gets a blackboard lesson in how to properly take a reservation and make out ticket.

Women Wanted

by

DONALD O. HERTY

With men being taken for war duty, there are many jobs in the airline business for which women can qualify. It's easy to get a position.

DON'T give up the airlines because you're not a glamour-cutie with a nurse's degree. To hear airline men talk you'd think women are doing with the airways what they've done with the barber shops. And there's something to it.

Once upon a time the only females who had anything to do with scheduled airliners were stewardesses. They were tolerated only because they brought heavy travel by plane. But three years ago or so a radical sales manager for Northwest Airlines startled the industry by peopling his sales staff in Chicago with a "bunch of dames," as the veterans called them with that what's-become-of-the-old-game crease between the eyebrows.

Hardly anybody would admit it until recently, but the women brought a certain indefinable quality into travel selling—call it sex if you will, but that's only part of the story—that kept the traveling salesmen coming back for more tickets. So Northwest not only kept the few girls already hired, but got more of them. As time wore on the men employees forgot to act as if they didn't approve of having the women around.

That was a mistake. They should have howled loud and long about the inefficiency of women, the lack of dependability, the unpunctuality and all the other alleged failings women possess. Because now they don't have any defense and women are flooding the sales forces of all the nation's airlines. Here and there in scattered instances they are sending small reconnaissance forces into even that masculine "Maginot," the operations department. Chances are, what with the draft and the management attitude of "every man a salesman," the dainty sex eventually will be blitzing into the heart of the operations forces.

Although the airlines haven't yet produced a millionaire, you don't find the personnel rolling their own. Any job you get, not counting out-and-out clerical positions, will mean $80 to $120 a month to start and more on the way up. What you need to get a job varies with the locale, the purely technical requirements and the airline; but all require a generous quantity of whatever it takes to wrap a man around your little finger in five minutes of conversation. Assuming you've got that and a face that doesn't crack mirrors and some clothes that don't hide your curves, you have a reasonable chance to pick up what other addenda you lack without going to school nights.

Because the most fertile field for feminine help is the traffic (sales to you, dear) department, it rates first place in the hearts of air-lorn careerists. Most traffic offices have three divisions, of which two are wide open to women: reservations and ticket sales. The third department is composed of what is known in the trade as "street men," who solicit business by pounding the pavement from door to door in business districts. Few women have ever made the grade here, partly because of the hard physical work involved, mostly because of men's undying belief in the myth of feminine softness. Short of executive jobs, these are the highest paying in air transport's sales end.

Women take to reservation work like barkers to a circus; they can talk to their hearts' content. This job takes pure salesmanship and a knowledge of your product, but little else. You may as well know it now—you've got to be a salesman, no matter what you're gunning for

(*Continued on page* 98)

"AERO"

by

E. JAY DOHERTY

No one can tell you what's what in aeronautics quicker than aviation insurance men. Aero Insurance Underwriters is one of the mainstays of this unique business.

Aero's main offices in New York are a modest exterior for a progressive, hard-working company.

Aero's aggressiveness is credited to supersalesman Fred Davey (left, above). Latest experiment by Aero is its low rate comprehensive policy for lightplane owners.

IF you had parked your plane in a farmer's field overnight, and after arrival at the field for the morning takeoff you found a cow had chewed off the ailerons, what would you do? One man whose control surfaces formed the cud for a contented milk producer called the Aero Insurance Underwriters. He got new ailerons.

A new wrinkle in an old countenance is aviation insurance. Practically unheard of 15 years ago, it has become an important part of the aviation scene in the United States. One can now insure himself, his plane, his employees and his airport against damage resulting to person or property through the operation of aircraft or aviation equipment—and at a reasonable cost. It was not so long ago that every operator suffered nightmares over the possibility of losing everything from one unlucky break without hope of reimbursement. Now he digs a little deeper but lives a great deal easier—with the security of insurance.

Pioneers in an endless drive for safety in flying that will bring more protection for less money is the Aero Insurance Underwriters. Its predecessor company —Barber and Baldwin, Inc.,—inaugurated air insurance in this country in 1922. It was the holding company for Aero Indemnity Co., which took aviation casualty insurance, and for Aero Insurance Co., a regular fire insurance concern that wrote physical damage insurance on aircraft. Although aviation insurance was not making millionaires in the 1920's, this group was profitable. In 1932, however, a combination of insurance companies with an infinitely more stable financial background bought out the stock of the original firms, and Aero Insurance Underwriters came into existence.

Entirely different in character from its predecessor, this combine is not a holding company, nor is it an agency. It is a company-owned association with an impregnable financial foundation. It acts as aviation underwriter for 35 stock insurance companies, 29 of which handle fire insurance, and six of which handle liability. The failure of any one member, unlikely as that is, would not affect insurance payments or coverage written by Aero Insurance because all members are responsible for each policy. Under such an arrangement, Aero Insurance Underwriters could hardly founder; it has, in fact, pioneered in many fields of aviation insurance and is now not an inconsiderable force in the recent growth of civil aviation.

Excepting only scheduled airlines, Aero Insurance will write insurance on anything with an aviation risk. It is the biggest company in the field, and has taken the lead in insuring private and commercial operators. Most spectacular recent move was the introduction in February, 1940, of its "all risk hull policy," which insures planes against any damages, with minor exceptions. The difference between this and other policies is that it names the exceptions, while most

policies name the damages against which the operator is insured. Thus certain unusual accidents like damage from battery acid are covered under the "all risk" policy, but not under others.

A man with an airplane insured under this policy not long ago landed his plane on an iced-over lake. When he had walked some 200 yards away he looked back. The plane was gone. Sunk. Aero Insurance came through with a check that bought another plane. Two years ago that man might have had all the insurance he could buy on his ship, and he would not have been reimbursed.

That is the kind of thing Aero Insurance is trying to do—to extend the benefits of insurance to cover any type of injury or damage in the aircraft field without making it too expensive for the average operator. Although there has been a consistent reduction in rates, officials of the company are not satisfied. They point out that an increase in the number of people who fly or a reduction in the volume of aircraft and allied accidents, or both, will reduce premiums. And that reduction can keep going down almost without end, depending on the extent of the two factors.

That puts the responsibility for lower premiums and, incidentally, the welfare of Aero Insurance Underwriters, squarely up to the aircraft operators. For the safety education of pilots, fixed base operators, airport managers and almost anybody connected with aviation, the company maintains several services. To every policyholder there is available a "pilot kit," containing a flight calculator and literature on safety. A bulletin is printed periodically for distribution to assureds and other interested subscribers giving safety hints with particular reference to the season of the year. One bulletin titled "Cold Weather Is Coming —Prepare for It Now!" warns against faulty cabin heaters, failure to "lag" the crankcase, the danger of fire after priming a cold engine and of heating a cold engine with a blow-torch.

The company maintains an engineering and inspection department, which gives it a competitive advantage over other aviation insurance companies. This department was founded by Jerome Lederer, who later became head of the Safety Bureau of the CAB. Not only does this department of the company compile accident statistics that are invaluable in forming insurance rates, but it has a staff of inspectors paid by fee, who inspect every insured airplane twice yearly. So complete are they that a Government official in Washington has said they are as thorough as the CAB inspections for relicensing.

The expense has been more than balanced, company officials believe, by the number of lives saved as a result. One inspector found a monkey wrench and two screwdrivers in the wings of a plane, and another discovered a rat's nest in a wing. Results of the examinations are given to the owners on request without charge. The inspections are made at the owner's convenience and with the idea that he is as interested in safe flying as the underwriters.

Many Aero employes are licensed pilots. Charles B. Ripley of its engineering department (above with company's Aeronca "Chief") prepares Aero's safety aids.

One inspector's report was as follows: "Believe carb wells have been neglected. Mechanic says he will clean same on engine checks. Right aileron hinge pins worn. Mechanic says he will install oversize pins. Found broken mag. ground wire—wing drain holes unpunched. Carburetor air valve worn out. Minor defects as result of this inspection were taken care of in my presence as follows:

1. Left rudder cable loose and frayed —replaced.
2. Aileron cables loose—rigged.
3. Elevator stick socket bolt loose—replaced due to bolt being undersize."

Biggest boon to business in recent years has been the CPTP. Aero Insurance Underwriters writes 60 per cent of all the insurance under this plan. The company grew so fast under the impetus of this new business that it had to take additional space for the home office at 111 John St., in New York's financial and insurance district, and increased its office staff fully 55 per cent in slightly more than a year, bringing the total employees on November 1, 1941, to 150.

The former home office was a large room filled with desks and filing cases. One side of the oblong was partitioned off into glass-enclosed spaces for the execu-

(*Continued on page* 96)

Pioneers in an endless drive to increase safety in flying, Aero provides steady stream of literature based on general theme of helping clients help themselves.

The Airlines and the Future

AMERICAN AIRLINES

Business deluge has overtaxed the airlines' DC-3's. Each of the few in existence flies nine hours daily.

by FRANK L. STEBBINS

Boomed by increased defense travel the airlines, despite a shortage of equipment, are looking forward to big passenger, mail and freight revenues.

WHILE overshadowed by the emphasis upon military developments, the airlines have been chalking up some records of their own. The year 1941 was not only the best in history for the scheduled operators but saw the laying of the groundwork for a tremendous expansion in all departments at the end of the war.

The final 1941 figures show that gross revenues for the 16 domestic airlines totaled about $94,000,000 or 25 per cent above 1940. Mounting operating costs, however, nullified this gain and kept net income for the group down to less than $4,000,000 or about 10 per cent below the peak earnings of $4,350,000 for 1940.

These added expenses were of a multiple nature. Personnel has had to be expanded and trained in order to handle new equipment as well as to replace employees called to military service. Mechanics not only had to be replaced but paid higher wages to foil "raiding" by aircraft manufacturing companies. Larger provisions for depreciation and obsolescence to offset equipment additions, have also taken their toll on earnings. Taxes have been only partly responsible for increased costs—thus far.

In an analysis of last year's earnings, it is important to make a very vital distinction when compared with 1940 results. In 1940, better than 25 per cent of the industry's earnings came from profits on the sale of assets—principally planes. For 1941, profits of this non-recurring nature were rather nominal. The thing that counts in airline operations is earnings from *normal* operations. The main business of an airline is to sell transportation in all of its phases—passenger, mail and express. The primary function of a scheduled airline operation is not to sell planes or airports. When looking at airline results, it is therefore essential to determine the source of profits reported in order to get a clear picture of *true earning power*. On this premise, airline earnings for 1941 are really better than they look as they represent, for the most part, genuine earnings developed from normal operations.

The gain in passenger revenue miles flown is another manifestation of the consistent normal growth of the industry. Flying a total of 1,340,000,000 revenue passenger miles during 1941 for a new peak, the airlines showed a gain of 29 per cent over 1940. Lack of sufficient equipment, however, prevented the group from recording as large a gain as for 1940, when that year showed an improvement of 54 per cent over 1939. Once again, the bulk of the gain in total revenues was contributed by passenger income. During 1941, passenger revenues were responsible for about 73 per cent of all revenues as contrasted with 70 per cent the year previous. This is nothing more than the continuation of the trend away from dependence upon mail income.

Stimulated by defense activity, air express revenues reached $3,000,000 during 1941, an increase of more than 40 per cent over 1940. Despite this gain percentagewise, air express does not bulk large in the total of airline revenues—accounting for only 3 per cent of the gross. Air express may continue to make rapid strides in view of the many developments currently underway to develop this activity.

The volume of air mail carried also hit a new peak during 1941, averaging an increase of about 25 per cent over 1940. This increase, however, was not translated into a like gain in revenues. As lower mail rates are being constantly imposed, the industry is carrying more poundage for less income. This is best illustrated by the fact that despite the indicated increase in volume, revenues were only up 9 per cent.

The annual reports of the Civil Aeronautics Board, and its decisions, have long pointed to lower mail compensation. The Civil Aeronautics Act of 1938 instructed the CAB to fix the amount of air mail payments to enable the individual carriers under honest, economical and efficient management, to maintain and continue the development of air transportation to the extent and of the character and quality required for the commerce of the United States, the postal service and the national defense. This broad policy has, for the most part, been followed by the CAB in its air mail rate decisions.

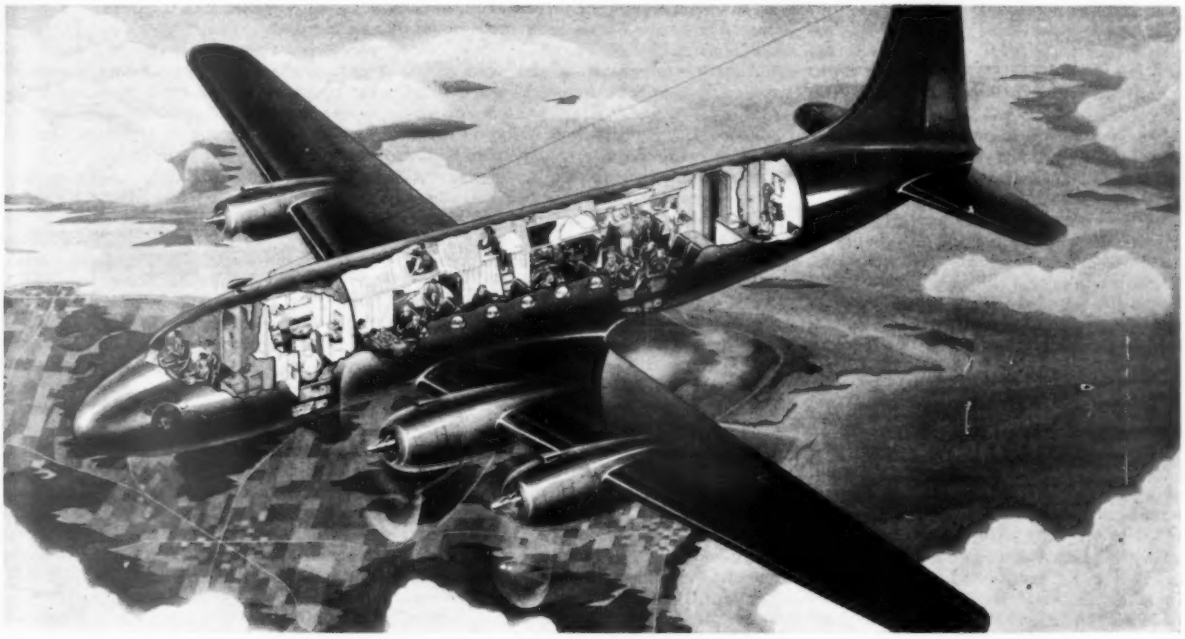
It is purely academic to argue whether or not the Post Office operates its air mail service at a profit. (It did so during its 1941 fiscal year.) As the airlines attain profitable operations, largely through mounting passenger traffic, it is logical to anticipate that lower mail rates will follow. Reduced to a pound-mile basis, the airlines received 1.79 mills during 1934 which has been gradually reduced to

.95 mills for 1940 with still further reductions indicated for 1941.

This whole question of air mail compensation is in the forefront of the industry's past, present and future. Yes, past because a number of Civil Aeronautics Board examiners have recommended retroactive mail adjustments be made. In the case of the American Airlines case, the examiner recommended that the company repay $1,240,000, representing an alleged overpayment for 1940. Recently, another examiner, reporting on Eastern Air Lines, recommended that that carrier return some $1,800,000 for the 18-month period ended June 30, 1941. If any of these reports are upheld by the whole CAB, a dangerous precedent will be established for the entire industry. In other words, no airline would be safe to assume that it could retain earnings previously reported. At any time, a CAB order could be expected to come in and in effect say: "You earned too much money last year, I guess we payed you too much in mail pay, please remit." This fear of recapture of previously reported earnings can prove to be very detrimental as no airline would know for sure if it were safe on counting upon retaining its earnings.

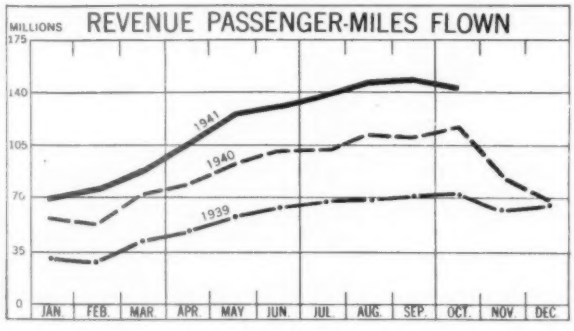
None of these examiner's reports are as yet conclusive, although admittedly they carry a lot of weight. The full CAB must render its decision in this matter. Final action on the American Airlines case is anticipated soon and may clarify much of the uncertainty. While it is difficult to presume how the CAB will rule in this pending action, it is the studied belief of authoritative sources that the retroactive recapture recommendation will not be allowed to stand. In part, this is based on the fact that under the Civil Aeronautics Act, the Board has no power to recapture earnings. As long as this issue remains unsettled, the airlines can not very well forget their past.

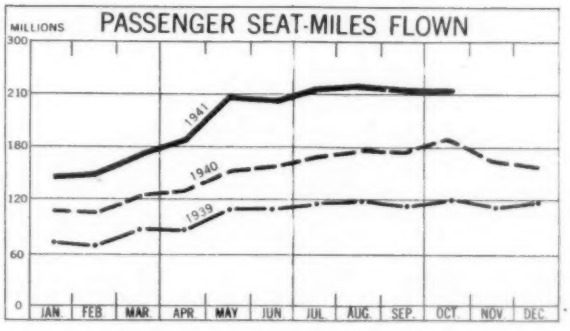
Mail compensation promises to be a potent factor as well on the present status of the airlines. Currently, the industry is subject to loss of operating revenues resulting from air raid warnings or diversion of planes for military missions. Regardless of whether scheduled flights are maintained or not, operating expenses continue unabated. At present, there is no offsetting compensation available. Some quarters have recommended that the CAB reimburse the airlines for losses sustained through such conditions, by the medium of increased mail pay. This would come under the national defense requirement of the law and may have a precedent in the CAB decision on the Chicago & Southern case. The Board, in this instance, ruled that the company should be compensated for the operation of a route before mail was actually carried on the run. In other words, a carrier can be paid by the Government for having service available without necessarily carrying the mail. This may be the way out for the airlines

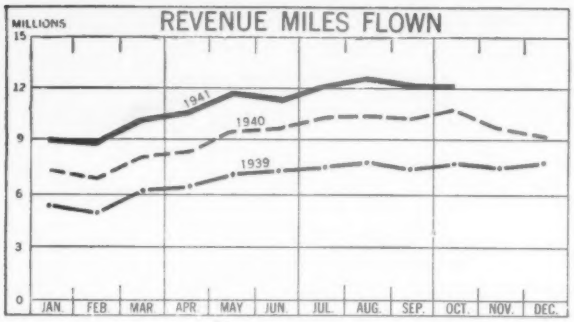


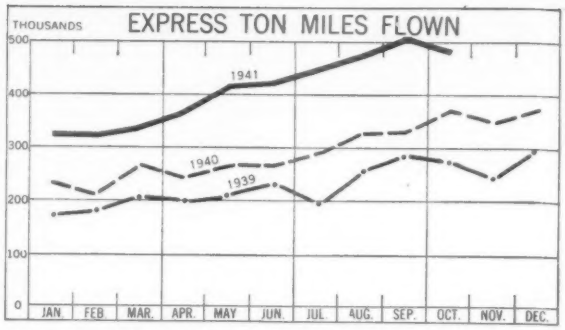
Barring war developments, the airlines may get limited number of giant Douglas DC-4's. Now on order, the new ships will carry 42 by day, 22 at night. Equipped with pressurized cabin, they have 262 m.p.h. top speed.

Airliners in 1941 operated at three-fourths seating capacity. These charts show comparative increases.









Although passenger and mail revenues showed gains, air express, still young, had sharpest increases.

in recovering any losses resulting from military factors.

Air mail revenues will mean very much to the airlines in the future. While the bulk of profits may be expected to come from passenger and express operations, the mail phase may provide the anchor and stability factor which will permit the airlines to carry through to net the profits realized from the leverage present in their passenger and express activities. This factor will continue to make the carriers dependent upon the Government for some time to come.

The airlines now occupy a key position in the nation's war effort. Maintaining and augmenting speedy channels of transportation and communication—thus speeding defense activity on all fronts—the air carriers are giving a good account of themselves. Nevertheless, military exigencies will largely determine the status the airlines are to occupy during this war emergency. Past results and trends are without effect in forecasting the near-term outlook for the industry.

The Secretary of War now has emergency powers to take possession and assume control of any civil aviation system, as well as to delegate to the Secretary of Commerce authority to regulate civil aviation for the duration. Informed quarters maintain that the air carriers will probably continue to function as private enterprises and the emergency powers may never be applied. It is asserted, for example, that while the President has innumerable emergency powers, he may not find any necessity for invoking all of these powers. However, in actively prosecuting a war it is imperative to hold as many "aces" as possible—just in case.

The new Office of Defense Transportation, while possessing broad powers to co-ordinate all forms of transportation, is not expected to make any serious adjustments in the normal operations of the airlines. All this office is essentially concerned with is to see that defense activity receives priority. That is precisely what the air carriers have been doing for more than a year on their own volition. More Governmental priorities on space with normal passenger business giving way at times whenever Army, Navy or defense personnel must utilize the airline network, may be anticipated. This phase promises to have some lasting beneficial qualities. Many new passengers are taking their first flights as a result of being directly identified with the defense effort. The time saving element of air travel has made this imperative. It is problematical whether they would have turned to the air for some years to come. However, once introduced to air travel, they become confirmed believers in this form of transportation and may be expected to carry this inclination for years to come. In other words, right now, the airlines are broadening their potential market.

As a direct result of the war effort, the airlines will be favored by sustained passenger traffic. There will be no assurance, however, of regularity of scheduled operations. Air raid warnings and plane diversions for military missions may at any time upset normal operations. Here, too, the air carriers have shown their flexibility in adapting their facilities and organization to emergency military operations.

Only a week after the Japanese onslaught, the Army chartered 12 planes of one airline for a special overnight mission. These planes were returned immediately afterward to the regular operation of the airline. In the interim, however, many schedules of this carrier were cancelled and much revenue was lost. Other plane diversions may be expected to follow. Through long experience, the air carriers have acquired that intangible "know-how" of the many and complicated processes required for the smooth operation of a national airline network. There is reason to believe that were the Army or any other agency of the Government to assume direct operation of the airlines, considerable delay might ensue along with the diversion of personnel from military duty where they are more urgently needed.

The Army experience in flying the mails following the cancellation of the air mail contracts in 1934, can not be easily forgotten. Hurried into an operation without previous experience, one Army pilot after another crashed in carrying the mails—until the air carriers resumed control of operations.

The domestic airlines are currently operating about 350 transport planes with an indicated seating capacity of about 6,000. In October, 1941, the Supply Priorities and Allocation Board permitted the airlines to place orders for 228 commercial transports. These planes were allocated to the various airlines, 112 to be delivered this year starting with June, the balance during 1943. All of these deliveries are subject to Army or Navy priority in event of military urgency. It is yet too early to determine whether or not the military will pre-empt this equipment now on order. It is significant to note that the SPAB recognized the vital part the airlines are playing in the national scheme of things in the war effort.

In any event, the airlines will have sufficient equipment to carry on, albeit somewhat limited as to their present potentialities. It is believed that should an air carrier show an acute need for additional equipment, the planes may be made available—providing of course there is no conflict with the military.

It is a safe surmise, however, that every plane in commercial service today is obsolete. It is true that these planes are highly serviceable and have many years of life ahead—but based on known aircraft developments, these planes are outmoded. One of the direct benefits of the military aviation effort has been the forced-draft research dictated by war necessities. Prior to hostilities, research in aviation moved at a snail's pace. Neither the aircraft builders nor the airlines had the resources to finance costly aircraft development projects. Supported by the Government, however, research development does not depend upon economic justification and money is no object. Many of the aeronautical advances incorporated in military planes can be carried over to commercial equipment. Hence, war-inspired research may be said to have been responsible for the immeasurable acceleration of advance developments to be incorporated in peacetime planes.

This will make possible the almost overnight realization of plans, once the war ends, which otherwise would have required years to consummate. When that time comes, luxury transports carrying upwards of 50 passengers will race through the substratosphere at speeds common to present-day combat planes. This equipment is already in the advanced stages and awaits but a signal before becoming a reality.

Aeronautical advances will also make possible the construction and operation of planes specially designed for express and cargo operation. Such planes, with material reductions in operating costs, may be able to tap a market which, heretofore, has been rather restricted.

Low-cost and economically-operated

(*Continued on page 94*)

NYA Mechanics

SEVENTY boys now assigned to the Fort Worth NYA airport project, set up at the municipal airport, are receiving work experience by assisting Government meteorologists in compiling weather data and weather reports, by aiding in the operation of the airport traffic control, by helping regular paid city employees in aircraft servicing and storage and by assisting in the inspection of airplanes and engines and making minor repairs.

Four hours each day these boys are engaged in actual production work, for which they are paid by the NYA. Related information and training classes for these young men include blueprint reading, meteorology, metallurgy and airport organization, in which each day another four hours may be spent. The teachers of these classes are provided by the Fort Worth public schools and by the State Department of Education. Ninety-four young men previously assigned to this NYA airport project have obtained jobs in aircraft industries.

With the assistance of the Texas State Employment Service, 21 youths have gone to work for the War Department at Hicks Field in Fort Worth, 11 for commercial airlines, 23 for private flying schools, four for the Civil Aeronautics Authority, eight for the Fort Worth Municipal Airport, two for the Wichita Falls Engineering School, 19 for the Duncan Field depot, two at the Corpus Christi seaplane base and four for the Randolph Field Air Corps flying school.

Twenty seaplane landing bases, to form a chain throughout Texas and to be constructed by NYA boys, have been approved by the Civil Aeronautics Authority and the national NYA headquarters. One base already has been built by the NYA on Lake Worth, near Fort Worth, Tex., and another practically is completed at Galveston. The seaplane landing base at Lake Worth has been designated as the regular overnight stop for the large seaplane bombers which the Consolidated Aircraft Corporation is ferrying across the United States.

As an important link in airports over the United States, 40 NYA boys are constructing the administration building for the Big Spring airport. Being fabricated of bitudobe brick, this administration building will include offices for American Airlines, the Civil Aeronautics Authority, the United States Government Weather Bureau, waiting rooms and a large concession stand.

Boys assigned to an NYA project have completed recently the construction of an administration building, a hangar and runways for the CAA-approved Sam Houston Airport in Huntsville. In Brenham and Alpine, NYA boys are building airport landing fields and administration buildings for airports which now are vital in those communities.

The National Youth Administration, in helping to provide adequate airport facilities and in giving work experience to Texas youth in airplane mechanics and in airport groundwork, is cooperating with city, state and Federal agencies.

FROM HEADQUARTERS

by Lieut. Col. HAROLD E. HARTNEY (A. F. Res.)

Harold E. Hartney

LOOKING about for some barometer that might reveal for our readers the amount of work actually being done here at Washington I hit upon the National Inventors' Council, but one small agency in dozens down here. Headed by an old friend of aviation, "Boss" Kettering of General Motors, and with Col. Leon B. Lent as chief engineer, a group of our best scientists has considered no less than 40,000 inventions of all kinds, most of them dealing with aviation, in 18 months.

Many of us are inventors; some of us have dealt with them. We all know the amount of diplomacy, patience, tact, study and man hours all this has entailed. Most other agencies cover relatively just as much ground but none reveals the volume more clearly than the Inventors' Council. While Colonel Lent has no "dough" to hand out from his own office, his group has been such a good filter that when something "gets by," it usually gets funds (and readily, too) from the agency most vitally concerned.

Colonel Lent, whom many will recall as being the first superintendent of the U.S. Air Mail before private contractors flew the airlines, is credited with exploring personally most of the novel inventions submitted and of being "a second Job" for patience in dealing with serious looking gentlemen. One long-haired gentleman appeared at the White House bright and early recently, demanding immediate entrance. He would see none but the President himself. With furtive glances he walked suspiciously and haltingly to the registry desk.

"But the President is much too busy, he cannot possibly meet you today." Day after day, interpolated with calls upon his Senators and Congressmen, this man who held the key to victory waited to show the big Chief himself the invention that was to save Democracy again.

Finally, White House Secretary Marvin McIntyre persuaded the persistent inventor to see Colonel Lent. He agreed, upon the condition that all the doors be locked during the interview. They met. Peeking behind every desk, radiator and chair the inventor whisperingly confided: "A great magnet suspended on a steel cable from a fast airplane will be swept over the ground troops and jerk every rifle from the enemy's grasp, rendering whole platoons impotent." "Yes," added Lent, "and I'll bet you never thought of another application"—never batting an eye, Lent went on—"just think," lowering his voice in seeming seriousness, "not only would it disarm them but if the tin-hatted soldiers kept their chin straps on, the magnet would suddenly pull heavenward all the steel helmets and strangle the whole bunch en masse!" Colonel Lent's reply displayed such interest and understanding that he became fertile ground forthwith for the personal "touch" to pay the man's fare back home to his people.

* * *

With Pearl Harbor, out came an order in both the War and Navy Departments here making it mandatory for all officers to wear their uniforms.

One major of the Air Forces appeared with his four rows of ribbons under his sterling pilot's wings. He was the envy of all the hard working brother officers, save one who took neither the tokens, nor that hard work which had won them, very seriously. Passing out of the Carlton dining room, the latter spied the gallant major, bedecked in all his gaudy bars. Pausing, he leaned over and whispered close to his ear: "Tell your host that if he'll give you another drink, buddy, you'll put up another row." The be-ribboned major grinned and hopefully reached in his pocket for a fifth bar of State ribbons!

* * *

Saw a movie this week taken of the instrument board on Jack O'Meara's plane, recorded from a camera fixed back over Jack's left shoulder during his last and fatal "six G" dive. The film was pretty badly mutilated but what impressed your correspondent most was the split seconds of time given a man to get out of a closed cockpit once a wing does let go. As we watched the picture run through for detail a second time and as we stopped it here and there to make a minute examination, we found that our mind just would not keep to the shocking film. We recalled problem after problem Jack had encountered so willingly year after year as he pioneered aviation. His set-backs and his successes paraded before us. Remembered an appointment he had with us the following week to discuss a very disconcerting situation we both were facing, a bridge which he thought he had to cross but which now he will never encounter. Jack may not have amassed much wealth but his memory is sure something to warm the hearts of the hundreds who were fortunate to have known him.

* * *

Stimulating to find some of the 20-hour-per-day Army and Navy officers finally receiving their just promotion lately. Thousands more are to come in aviation ranks, if the 160,000 plane program becomes a reality before the Axis powers fold up.

Your correspondent sharpened his pencil and figured out that by January 1, 1944, every flying officer in the Air Forces of the Army today will be at least a major and if we really get going at the pace set by American officers flying on the front in the last war, we will have dozens of lieutenant colonels who will not have

(*Continued on page 94*)

War Goes into the STRATOSPHERE

by COURTNEY RANDALL

Dr. Sanford Moss' invention lets engines "breathe" at heights seven miles above the earth, where airplanes have created modern war's new battlefield.

Dr. S. A. Moss

WAR in the stratosphere, something new and memorable in the long history of battle, became a reality on July 25, 1941. Boeing *Flying Fortresses* on that date rained bombs on the German battleships *Scharnhorst* and *Gneisenau* in French ports from around 35,000 feet. Though it was a summer day, the bombers were so high that they were covered with frost and the British Air Ministry announced that the attack took place at such a "fantastic" height that the scream of the bombs was probably the first warning.

This news came as no surprise, however, to the United States Army Air Corps nor to Dr. Sanford A. Moss, a bearded little General Electric Co. engineer of Lynn, Mass., and recipient of the 1940 Collier Trophy for his outstanding contribution to aviation. They saw nothing fantastic in the big Wright-engined planes carrying full bomb loads so high that they were scarcely visible from the ground. In fact, they had been planning for this sort of thing with a great deal of patience and ingenuity for 23 years.

The Air Corps, especially the engineers at Wright Field, and Dr. Moss pioneered the airplane supercharger, the device which permits aviation engines to "breathe" normally when aloft by forcing great power-producing quantities of air into their carburetors. To a very large degree, superchargers determine the height, speed and range of aircraft. These are vital factors in war and matters which the Air Corps and Dr. Moss, who does not fly, have long pondered.

There are two kinds of airplane superchargers. One type is gear-driven by the shaft of the engine itself. In the other, exhaust gases of the engine turn a turbine which operates a compressor sending air into the engine without appreciable drain on its power. The latter is known as the turbosupercharger. The Boeing *Flying Fortresses* which bombed the German battleships in July are equipped with this type. It was the first officially revealed use of the device in combat.

With the exception of a few small pleasure craft, every American airplane is equipped with at least a gear-driven supercharger. Turbosuperchargers, besides being part of the equipment of the latest Boeing bombers, are used in Republic's *Lancer* and *Thunderbolt* fighters and Lockheed's great interceptor pursuit ship, the P-38. The last named climbs a mile in the first minute and is designed to battle bombers above 35,000 feet. It is going to England as the *Lightning*.

The Army's Lockheed P-38 interceptor is equipped with latest turbosuperchargers for its twin Allisons. Army engineers helped develop the superchargers at Wright Field.

Boyhood service as a mechanic trained Dr. Moss for work on problems dealing with air pressure. He was born in San Francisco on Aug. 23, 1872, and at 16 was apprenticed as a mechanic in a San Francisco machine shop which made air compressors for mine work. In this period, he first became interested in doing things with air, and at the same time learned mechanical tricks which in later years gave him advantages in competition with scientists of only theoretical knowledge of the handling of air and gases moving with the power of a tornado.

After completing his four-year apprenticeship, he studied mechanical engineering at the University of California. To earn his expenses, he swept out the university machine shops, read to a blind student, drove a delivery wagon and corrected examination papers. He received a B.S. degree in 1896 and an M.S. degree in 1900. After an interval as a draftsman, he went on to Cornell University as a graduate student and instructor. A thesis on the gas turbine earned him a Doctor of Philosophy degree and a job with General Electric in 1903.

He continued to work on this project at the West Lynn, Mass., works of the company, but materials then available were not strong enough to withstand the strains in the proposed gas turbine. It had to be postponed, but, in the course of his work on it, he developed a number of devices, notably a centrifugal compressor which found wide use in blast furnaces and iron foundries.

Because of the success of his compressors, Dr. Moss was one of the men to

Flying Fortresses Up So High
It's Fantastic; Batter Gneisenau
By The Associated Press
LONDON, July 25 (Friday)—American-made Flying Fortress Boeing bombers bombed the German battleship Gneisenau at Brest yesterday from a height so "fantastic" that the scream of bombs was probably the first warning the Germans had of the attack, the British Air Ministry news service reported today.
The bombers were so high that they would have been scarcely visible from the ground and were "certainly inaudible," it said, adding: "With summer far below them, they were covered with frost and rime a quarter of an inch thick."
Scharnhorst, Moved, Is Blasted
From the Herald Tribune Bureau
Copyright, 1941, New York Tribune Inc.
LONDON, July 24.—Less than twelve hours after the damaged German battleship Scharnhorst was discovered by a British air reconnaissance to have been moved from Brest to another French port, La Pallice, 240 miles to the south, Royal Air Force bombers opened late yesterday a battering attack on the Scharnhorst and on her sister ship, the Gneisenau, which was also at Brest, and scored direct hits on both vessels with armor-piercing bombs.
(Twenty-two British planes, including fifteen bombers, were lost in these operations and twenty-four German fighter planes were shot down, the Air Ministry announced at London early today, according to The United Press.)
Waves of R. A. F. planes meanwhile were making offensive sweeps over much of northern France, fighter-escorted bombers striking particularly at the railroad yards at Hazebrouck.
Last night the R. A. F. bombed Frankfort on the Main and Mannheim, German industrial cities, for the third consecutive night. Particularly large fires were set at Mannheim. The docks at Nazi-held Le Havre, France, and Ostend, Belgium, also were bombed.
Four-motored Boeing Flying Fortress bombers recently arrived from America took part in the assault on the two 26,000-ton Nazi warships, as did British Stirling bombers, which also carry tremendous bomb loads.
Three separate attacks were made
NEW YORK HERALD TRIBUNE

Development of the turbosupercharger has made our "Flying Fortresses" the highest flying bombers in the world. It also helped pioneer the modern pressurized cabin.

whom the National Advisory Committee for Aeronautics turned when the United States entered the World War for a solution of the problem of giving war planes greater power. Dr. William F. Durand, NACA chairman, had been a member of the Cornell faculty during Moss's years there. The scientists of England, France and Germany were also at work on the problem. Dr. Moss's answer was a wooden model of the turbosupercharger, which was essentially just a combination of his compressor and the gas turbine which had been shelved. Something similar had been tried in France but had not worked.

Col. Howard C. Marmon, a member of the famous Indianapolis motor car family, was then commander of McCook Field (now Wright Field). As soon as he saw the plans, he authorized construction of a working model and one was rushed to completion. In their own words, the engineers said they had a device "to kid an airplane engine into thinking that it was at sea level." This was fitted to a Liberty motor and given a roaring ground test by Air Corps engineers at Dayton.

It performed so well that Col. J. G. Vincent, who had succeeded to the McCook Field command, authorized a mountain top test for the turbosupercharger in the thin atmosphere which it was designed to conquer by forcing great quantities of power-producing air into the engine. Pike's Peak, 14,109 feet high, was chosen as a site. Dr. Moss, his assistant Waverly Reeves, an Army sergeant and four privates were designated for the test. This was performed in six weeks beginning in September, 1918, with snow often covering the equipment.

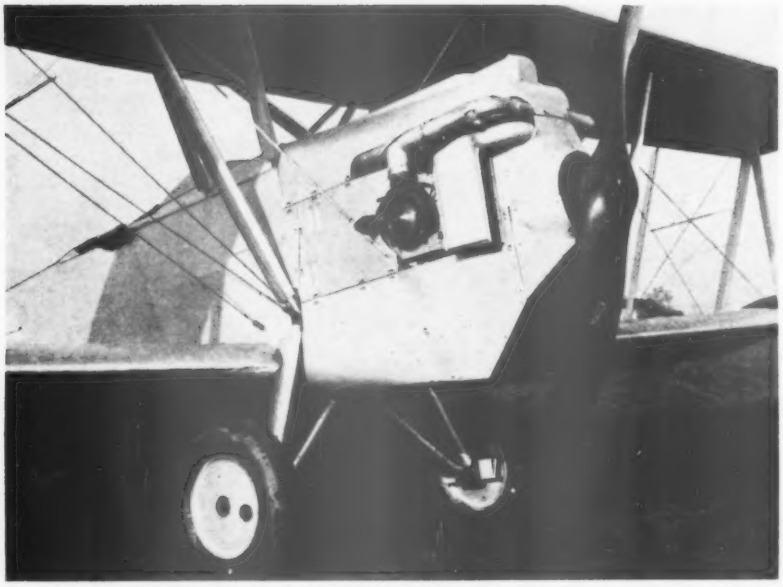
Without the supercharger, the Liberty engine which had given 350 h.p. at Dayton produced only 230 h.p. on the mountain top. With the supercharger, however, the engine actually produced 356 h.p.!

Maj. R. W. Schroeder, then head of the Air Corps' flight test section and now a United Air Lines vice president, states:

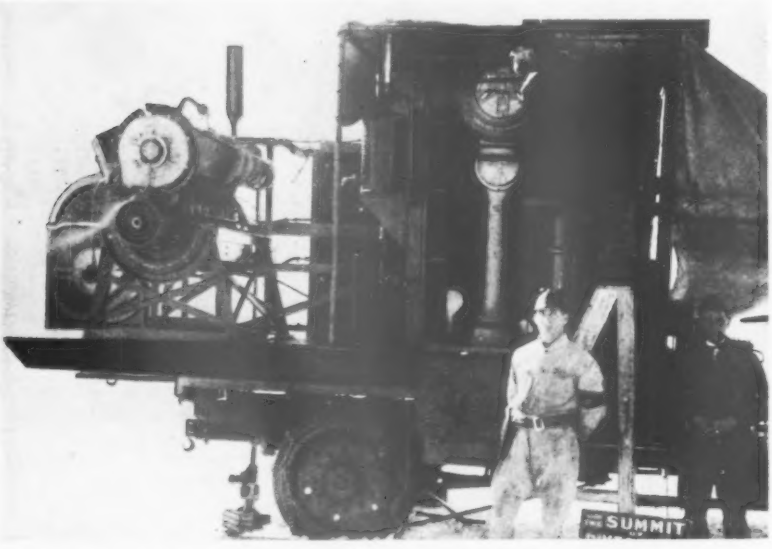
"The Armistice halted most World War research, including superchargers. However, the flight test section of the Air Corps headed by myself kept the supercharger project open with the result that Dr. Moss was able to continue his work to more definite conclusion.

"Dr. Moss and myself worked continuously together to keep this project from being shelved. We made the first flight of a supercharged engine before any other country had progressed beyond their ground experiments.

"The first flight ended at about 20,000 feet due to over supercharging the engine,

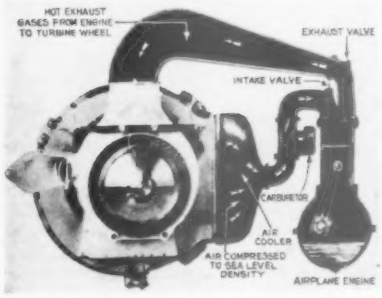


This early installation shows how turbosupercharger is connected with engine exhaust. Capts. St. Clair Streett and A. W. Stevens flew this ship to altitude of 37,854 feet.



Tested atop Pike's Peak this Liberty engine with supercharger produced more horsepower than it did at Dayton, O. Its inventor watches test from atop ladder at right.

Diagram showing how supercharger compresses thin air to sea level density.



which in turn caused a connecting rod to break out through the crank case. On every flight thereafter something about the engine or supercharger would fail at high altitudes during supercharging. Each time something was learned, corrective measures taken and tests resumed. On these flights test projects were set up each 5,000 feet starting at 20,000 feet, which was the normal ceiling of the Le Pere biplane with an unsupercharged Liberty engine.

"We were able to complete tests at 25,000—30,000 and 35,000 feet. It was during the test at 40,000 feet that I failed instead of the engine or supercharger."

It was on Feb. 27, 1920, Major Schroeder soared alone to 38,180 feet for probably the most dramatic record of all. At that level his oxygen supply was exhausted and he plunged unconscious for five miles but miraculously regained control of the plane near the ground and landed safely. The 67° below zero temperature which he encountered had frozen his eyeballs and he spent some time in a hospital.

On Sept. 29, 1921, Lieut. J. A. Macready took the same plane up to 40,800 feet and Major Schroeder, out of the Army by then, telegraphed congratulations on "winning the crown of icicles." Nobody had ever flown so high. Later Capts. St. Clair Streett and Albert W. Stevens of Wright Field set a two-man record in a turbosupercharged plane by flying to 37,854 feet to make aerial photographs.

The altitude records, however, were incidental to the turbosupercharger development which aimed not only to send a plane to high altitudes but to give it speed and power over a wide range of altitudes. To this end, E. T. Jones, Adolph Berger, Opie Chenoweth and a succession of engineering and flying officers labored for years at Wright Field. Dr. Moss, Samuel R. Puffer, Edward B. Clarke, W. H. Allen, C. H. Auger and other General Electric men also worked on the technical problems involved.

Something of what had been achieved was revealed in 1939 when Capt. C. S. ("Bill") Irvine and Capt. Pearl Robey flew a Boeing B-17 *Flying Fortress* at an average speed of 259.398 m.p.h. over a 1,000 kilometer (621.3 miles) course at an altitude of 20,000 feet while carrying a 5,000 kilogram (11,023 pounds) load. Capt. C. J. Crane and Lieut. P. G. Miller were navigators of the ship.

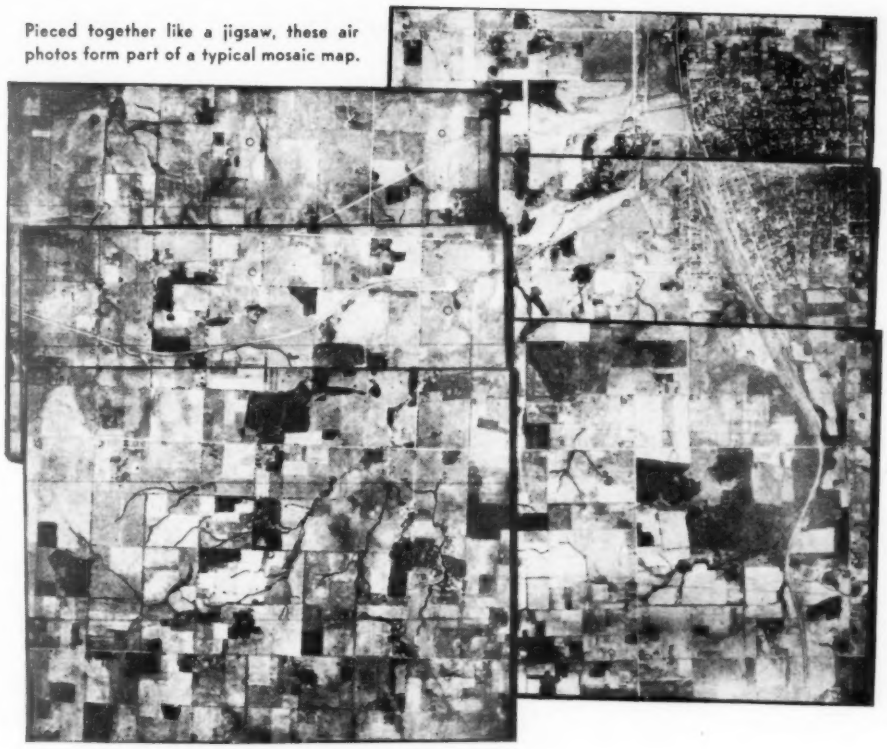
On the same day Maj. Stanley M. Umstead of Wright Field, chief of the flying branch of the Air Corps Materiel Division, and a crew flew another *Flying Fortress* coast-to-coast in 9 hrs. 14½ min., never dropping below 20,000 feet and flying for a time at 33,000 feet for an average of 267 m.p.h. for the 2,460 mile flight. Capt. Leonard F. Herman was co-pilot, Mark Koogler, mechanic, and Louis Sibilsky, aeronautical engineer, both of Wright Field, completed the crew.

The superchargers, however, were not recognized as promptly as their Air Corps backers and Dr. Moss would have liked. In an effort to increase their popularity, he fitted some automobiles with them, and cars, so equipped, one driven by Pete de Palo, took honors at the Indianapolis Speedway.

Enthusiasts for the device, however, did not despair. Dr. Moss piled up a total of 45 patents, mostly in this field and argued for the supercharger, particularly the turbosupercharger, with Government officials and business executives, and in the pages of technical magazines. Of Dr. Moss, the editor of Mechanical Engineering once wrote:

"Painstaking, nervous, his eyes sparkling with fun or fury, Dr. Moss raises his pointed beard in his companion's face and looks at him through the lower lenses of his glasses. His tongue, trying to keep up with an agile mind, is ready for a persistent barrage of embarrassing questions

(*Continued on page* 114)



Pieced together like a jigsaw, these air photos form part of a typical mosaic map.

America Poses for Its Picture

by KURT RAND

Aerial photography is producing mosaic maps of the U. S. that help in soil conservation and are vital to defense plans.

MEN have made maps ever since they first began to move over the surface of the earth, or to sail across uncharted seas to distant horizons. They were made by guess-and-by-gosh, by hand and by machine. But when men took to the air like birds and saw below them the world in miniature, new fields in map making and aerial photography came to the fore.

Giant jigsaw puzzle maps, termed aerial mosaics, are now being made by the Cartographic Division, Soil Conservation Service, U. S. Department of Agriculture, as a result of experiments in aerial photography.

While bits of stone, glass and gold were fitted into patterns and pictures in valuable old mosaics now in world museums, modern aerial mosaics are made of many small vertical photographs fitted together, in a similar manner, to present composite pictures of thousands of miles of valleys and mountainous terrain. Once fitted together, the pictures are rephotographed and enlargements are brought up to any desired size. The value of such maps and photographs to our present and future defense and offensive efforts cannot be estimated in dollars as can the mosaic work of the old masters. It is quite possible, from recent activity in this field, that many maps for use by the military and Naval forces in the future will be huge map photographs showing exact conditions of terrain and locations of populace.

Putting control points on aerial photo to assure accuracy in the overlapping.

There are approximately 3,000,000 square miles of land in the United States. So far, more than three-quarters of this area have been photographed and mapped from the air. The largest aerial mosaic made up to the present time covers an area of 35,000 square miles. It is possible for as many as 18 square miles, or 11,500 acres, to be included in a single section of the jigsaw puzzle maps.

Recently, the Army has been using aerial mosaics to obtain bird's-eye views of defense areas. Large Army projects in Florida, Kentucky, Texas, Oklahoma, Iowa and on the west coast, have been included in mosaic mapping activities, particularly in connection with purchases of land for use by the Quartermaster Corps for storage of ammunition and chemicals.

The aerial mosaic is not to be confused with topographical photography used for contour maps made with stereoscopic in-

Thin aluminum plates covering floor (above) serve as base for laying out the mosaics.

struments, according to J. M. Snyder, chief of the Cartographic Division. When viewed from two angles, contour maps present a three-dimensional effect with the use of stereoscopic lens similar to the red and green glasses handed out in movie houses. In three-dimensional movies, ghostly hands reach out for bared throats, or toss spiked clubs into the faces of the gasping, quaking audience. However, in three-dimensional maps, it is possible to compute the heights of mountains and depths of valleys. It is necessary to obtain photographs from two different angles in topographical map making, while an aerial mosaic is simply a flat photograph composed of small photographs upon which an Army officer might outline different properties and their acreage. Neither are they controlled maps, unless called for in Government specifications; that is, they are not maps with control points laid out, before flights are made, and visible on the finished map to permit dead reckonings.

The controlled mosaic, as in other controlled maps, contains established and definite control points wherever necessary. These points are later used in scaling, orienting and locating a specified area for mapping purposes. Control points may be the General Land Office sections, generally at crossroads, or any fixed object easily identified. When suitable topographic features are not available, control points are often indicated by a circle of lime 50 feet in diameter, or other white material. Pieces of cheesecloth, six to eight feet square, placed in the form of a cross are also used—the point being the center.

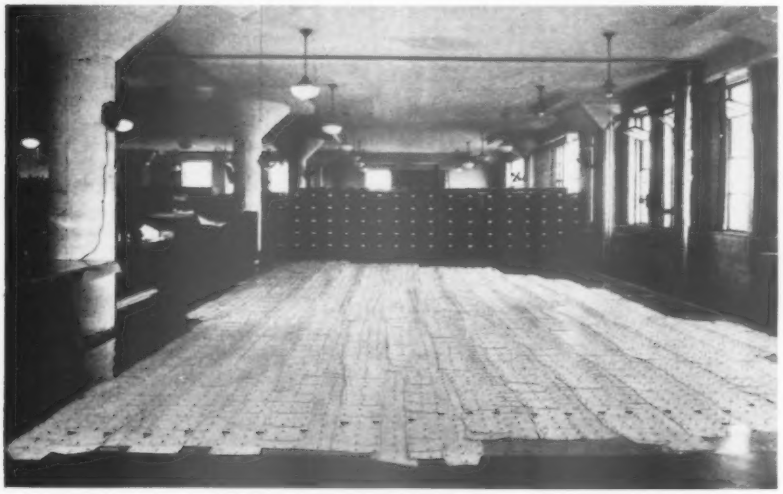
The initial work of aerial map making is done by commercial flying companies under contract to the Department of Agriculture. While film strips of flights are developed by the aerial photographer, the setting up and rephotographing necessary to obtain a finished mosaic are done in the Beltsville, Md., laboratories.

All equipment, including plane, crew and camera equipment, is owned by the flying companies. Five companies are under contract for this type of flying at present. To obtain the photographs, a single lens camera is loaded with highly sensitized film capable of making 150 exposures. The cameraman flies back and forth, from north to south, in parallel lines two miles apart over the area to be photographed. While flying up and down, at one-mile intervals, a photograph is taken. The Government furnishes the flying cameraman with marked copies of flight maps of areas to be photographed. So exacting is aerial map making that flight strips must be within five degrees of the specified direction and mean bearings of adjacent strips must be within five degrees of parallel. Photographs are never taken on "banks" between courses. After one line is flown and before the next exposures are made, the pilot is required to get into position on a prolongation of the line of the new course at least one mile behind the point where the first exposure of the second flight is to be made. An overlap of 60 per cent in line of flight when making aerial mosaics is required by the Federal agencies engaged in this particular phase of map making. Any exposures made through miscalculations of the plane crew which show an overlap of less than 55 per cent or more than 65 per cent are rejected. Matching these overlaps when putting the mosaics together requires all the ingenuity of the most able and adept of jigsaw puzzle workers. While number symbols appear on each exposure and permit each picture to fall into its proper place, the overlaps require ability to match tree to tree, rock to rock and hill to hill. Only the center, or approximately one third of each vertical photograph, and inside and central sections of oblique pictures, can be used in putting the maps together. This restrictive use of the pictures eliminates most of the distortion of images which appear at the sides of the strips. All pictures must be accurately transformed and printed to a uniform scale. Pictures, and thus maps, of a uniform scale may be obtained only by flying the plane at a constant elevation above the ground with the camera synchronized with the speed of the flight. Variation in elevation results in a difference in scale between pictures. Controlled mosaics of an area of low relief, constructed of vertical photographs, approach in correctness an accurate map drawn from ground surveys.

Aerial photogrammetry is new and the technical problems involved in setting up maps of any sort from aerial photographs are not easy to solve. In putting together planimetric maps used by the Soil Conservation Service, for instance, the primary problem is to secure horizontal control necessary to place the aerial photograph centers in their correct positions on the map. When this has been accomplished errors of position of other points must be eliminated. These errors are the result of displacement of ground points on the photographs due to the relief of the ground. Lens distortion, tilt and paper and film shrinkage are other factors

(*Continued on page* 104)

Photos, reduced to templates made of stiff material, grouped together to form map.



We CAN Lose This War!

by CY CALDWELL

An honest facing of realities will reveal that stern measures are necessary if the United States hopes to achieve decisive victory over the air-conscious Axis.

Cy Caldwell

THE people of the United States must wake up and face facts. We must realize that we are in the most decisive war in the history of the world, a war that will decide the world's destiny for possibly hundreds of years to come.

This is not merely a war between conflicting imperialisms. It is far more than that. It is a world revolution; it is ruthless tyranny imposed upon the peoples of the world: the peoples of Germany, Italy, and Japan, as well as upon the peoples of nations those despotic powers already have conquered and now hold in subjection. If these despotic powers at last overwhelm the remaining free nations, if they then deprive them of military force and seize the war industries of those nations, the conquerors, by retaining to themselves the sole right to manufacture the weapons of war, will be able to enforce a despotism that will rule the world for centuries.

We are in the war. But we did not go into it boldly, taking a reasoned decision to go forth and fight these forces of oppression. On the contrary, we helped Britain, China, Russia to fight a war that should have been our war from its start; we supplied them with the weapons of war, even paying for them ourselves under the lend-lease act, under the mistaken idea that we could hire others to do our fighting for us.

With such a muddled peace-war national psychology, it is not surprising that we did not enter the war until we were stabbed in the back by Japan, slapped in the face by Germany's war declaration. We had tried to buy off this war—though history tells us that no nation ever bought off a war or a revolution.

Thus, hampered by our reluctance to fight, lulled to a sense of security and complacency by our mistaken wishful thinking—and under-rating the power, the resourcefulness and the audacity of one of our enemies—we have lost every one of the opening moves of this war. If we continue as we have begun, if we suffer a series of defeats and retreats, we may lose the war.

That is not defeatist thinking. It is an honest facing of realities. The sooner we realize that we *can* lose this war, the sooner will we take the stern measures necessary to win it.

It is my purpose to comment critically upon the opening moves of the war in the Pacific, with special reference to the vital part played by Japanese aviation and the pathetically small part played by our own numerically inferior air forces.

It may fairly be asked: by what right and by what authority does this civilian speak his mind and dare to criticize the actions—or rather lack of action—of the responsible military authorities? The question is answered by Louis A. Sigaud, former lieutenant colonel, Military Intelligence Reserve, U. S. Army, in his book, "Douhet and Aerial Warfare":

"War is no longer," he says, "the sole concern of military forces. It is a struggle in which all the resources of the nation are involved. There are no longer combatants and non-combatants. There are, in effect, no longer any civilians. When war becomes so closely the concern of everyone, the problem of national military doctrine or policy becomes the problem of every individual. It is not exclusively a question of purely military competence. As Douhet has said, 'All citizens realize they are belligerents, and all take part in the war which is no longer a matter of indifference to anyone.'"

Secrecy of necessity cloaks the grand strategy of a nation at war. No citizen expects to be told by his Government what moves are in progress, for this information would be invaluable to the enemy. However, when the strategical plan of a campaign, or a part of it, has been carried out to end in disaster, then the citizen of a democracy has every right to study the campaign and come to his own conclusions. Such inquiring and sometimes bitterly complaining critics are often brushed aside as "armchair strategists," markedly inferior to professional soldiers who have made a lifelong study of war, and who hence may be expected to know far more about it than the civilian, even if he served as a soldier himself and also spent much time studying war.

But if professional soldiers, assisted or hampered by professional politicians, know so much about war then why, in the name of common sense, do so many of them make such a ghastly mess of it when the fighting starts?

Why did the French and English general staffs so grossly under-rate the devastating power of the German army and air force? Why did they fail to see in advance the co-ordination of mechanized armies and air forces, which resulted in knifing their armies into impotence? Why did Goering and his air staff so completely misjudge the fighting ability of the RAF and the stubborn strength of the English people to endure bombing? Why did Hitler and his general staff make such a bad guess about the supposedly

(*Continued on page* 80)

Independent in thought and action, Cy Caldwell has long been a vital force in aviation. Writer, lecturer and radio commentator, his own years of experience, dating back to combat flying in World War I, guide his incisive and critical analyses of today's war in the air.

Canadian-born, but an American citizen since 1929, Cy now is 50 years old and lives at Island Park, Long Island, N. Y.—Ed.

Use Our Idle Schools!

by the Hon. JENNINGS RANDOLPH
United States Representative from West Virginia

Sorely needed aviation mechanics should be trained in private trade schools at Government expense, the author contends. Many such schools await utilization.

THIS country, in its hurried effort to build the greatest military air force in the world, has encountered many obstacles which have, at one time or another, threatened to stall the entire program. There was, in the beginning, a shortage of factory space. Then there developed other shortages—of necessary minerals or other materials—which imperiled our building construction. We have found ways to overcome most of these and at last seem to be on the way to real, significant aircraft production—on a scale that will influence the outcome of the war. Orders for $4,000,000,000 worth of airplanes had been placed before Pearl Harbor [see page 24.—Ed.] and our entry in the war meant that production schedules must almost be doubled in 1942.

Will these production schedules be met? Have we gotten through the last bottleneck? Those in close contact with the plane manufacturing situation would not answer yes to either question. For we are, as we approach large-scale production, also growing nearer to what is probably the most serious bottleneck of all—a shortage of skilled workmen.

The other kinds of shortages have been overcome. Factories have been expanded quickly and the strategic materials shortages have been circumvented by prompt action. But the manpower shortage which now impends will not yield to solution so easily, unless immediate steps are taken. There are no stockpiles of trained men in this country from which can be drawn the thousands of workmen who will be needed within the next few months in our aircraft factories.

Unless we start immediately to train airplane mechanics who can do the delicate work of putting together and keeping together the planes we need, our whole endeavor is likely to bog down. The Federal Government must place its full weight behind a training program for mechanics. To accomplish this end, I introduced in the House of Representatives September 19, 1941, a bill which provides for the training of mechanics, under authorization of the Civil Aeronautics Authority, just as that body is now training pilots. A companion measure was introduced at the same time in the Senate by Pat McCarran of Nevada, leader in aviation legislation.

The wording of this proposal follows:

"That the first sentence of Section 2 of the Civilian Pilot Training Act of 1939 is amended to read as follows: 'The Civil Aeronautics Authority is authorized, within the limits of available appropriations made by Congress, to train civilian pilots and mechanics or to conduct programs for such training, including studies and researches as to the most desirable qualifications for aircraft pilots and mechanics."

The effect of this legislation would be to give the CAA authority to organize training courses for mechanics in accredited private schools. There are about 46 private institutions in the country which are now approved by the CAA. These have facilities which are not being used.

It is obvious that the existing training facilities, including all the classes which the United States Office of Education is trying to rush into operation, cannot begin to turn out the thousands of mechanics and technical specialists needed in the air industry. The Government's effort, under the present policies, seeks to set up an entirely new system of aviation classes.

With the demand for skilled airplane workers already exceeding the supply, the wise course would be to put into *immediate use all the training capacity available everywhere in the United States.* Instead, the Government's present effort is, in effect, seeking to close the CAA-approved schools and others, which, through the years prior to this emergency, have supplied aircraft factories with thousands of capable workers.

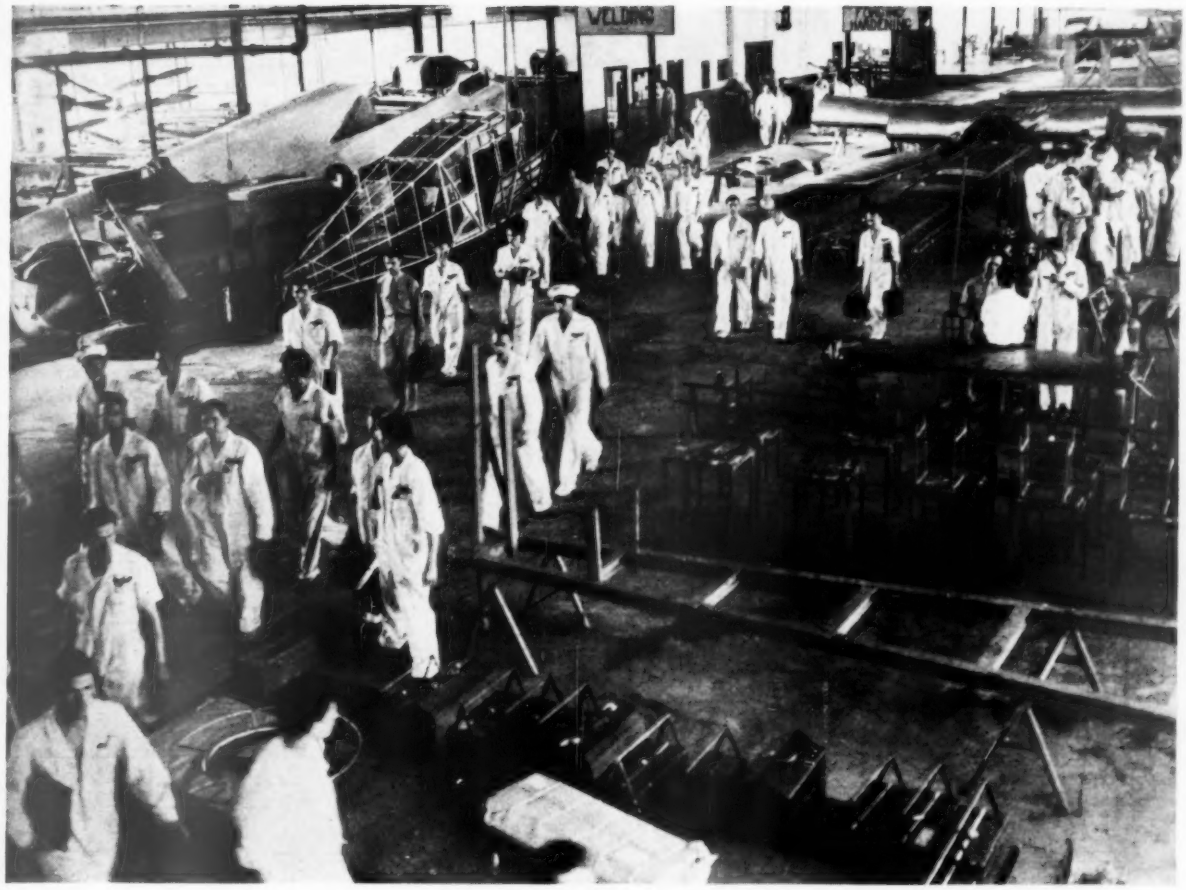
The objective of my bill is to see that we approach the job of training mechanics in the same sensible fashion that we trained pilots. When the necessity for training civilian pilots became apparent, the Government did not attempt to set up a new educational organization. Instead, it very sensibly went to the training schools already in operation and handed these the job. The colleges and universities were made the sponsors, and the non-scheduled aviation operators were enlisted as the flight instructors. The operators were in private business.

It would seem only natural that when the necessity for training mechanics became urgent, the Government would repeat the operation which was so successful in pilot training. Certainly, from the start, we should have made deals with private mechanic schools and begun training thousands in classes that have already produced hundreds of skilled workers in the aircraft industry.

Instead of this, another expedient was tried. Since July, 1940, the sum of $88,900,000 has been spent by the United States Office of Education on the training of workers for defense industries. The largest group of students has been that for the aircraft industry. The Office of Education has allotted money to the states, which in turn make grants to public schools. These schools have established free courses for training workers for the aircraft industry. A majority of those trained have received instruction in some specialty, such as welding or sheet metal work. The number of fully trained mechanics turned out has been so small that figures are not available.

This is not intended as a criticism of the job which the Office of Education has done. Figures furnished by that office show that 264,400 men have received some type of training, preparing them in some measure for work in the industry. It is apparent, however, that the Office of Education program is not extensive enough to keep up with the demand, nor is the training intensive enough to meet requirements.

It is incredible that we should, in seeking to train an army of mechanics, have ignored entirely the private institutions which were established and ready to help with the job. The Office of Education has held that its appropriation can be used only in subsidizing tax-free, public schools and that the private mechanics



Nation's many recognized aviation schools are fully equipped to handle training of additional thousands in big "classrooms" such as this at Parks Air College.

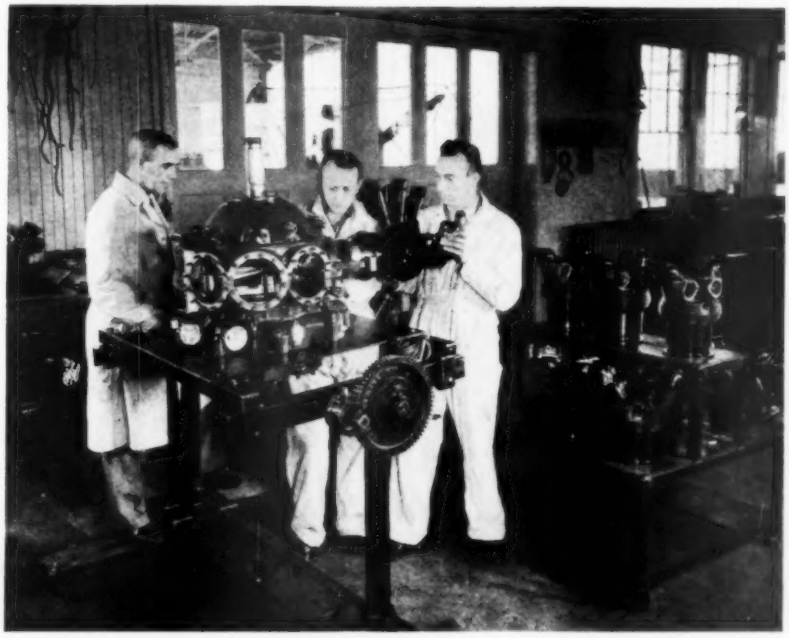
schools are not eligible to participate.

The result has been that the private schools are idling along. They are training mechanics for the Army and they are training some private students. But, at the present time, they are not operating at more than a quarter of their capacity. If the Government acts, I am told, these schools *can immediately enroll more than 30,000 new students. These men would emerge in a short time as expert mechanics.*

Virtually all the manufacturers are forced at the present time to run their own training schools. This means that experienced men, who are needed on the factory floor, are being used as teachers. In setting up new schools or expanding old ones under Office of Education grants, it has been necessary for public institutions to obtain machinery and materials. The latter, had it not gone to the schools, would have been used in primary defense work. *And this, while sheets of metals and machines in private schools were lying unused!*

Few people really comprehend the great demands which will be placed on the aircraft manufacturers during the year 1942. This industry is expected to turn out no less than 60,000 planes. The Department of Labor estimates that before the year ends, there will be more than a million men employed in aircraft manu-

This Boeing School machine shop is typical of similar equipment at trade schools throughout the country. Such schools are excellent for Army or Navy ground courses.



77TH CONGRESS
1ST SESSION

H. R. 5695

IN THE HOUSE OF REPRESENTATIVES

SEPTEMBER 19, 1941

Mr. RANDOLPH introduced the following bill; which was referred to the Committee on Interstate and Foreign Commerce

A BILL

To amend the Civilian Pilot Training Act of 1939 so as to provide for the training of civilian aviation mechanics.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled. That the first sentence of section 2 of the Civilian Pilot Training Act of 1939 is amended to read as follows: "The Civil Aeronautics Authority is authorized, within the limits of available appropriations made by the Congress, to train civilian pilots and mechanics or to conduct programs for such training, including studies and researches as to the most desirable qualifications for aircraft pilots and mechanics."

Introduced by the author, this bill would add mechanic training to far-ranging CPTP program.

facture. The employment in the industry at the close of 1941 was estimated at about 600,000.

Each month, it will be necessary for the industry to add twice as many workers as the month before, and some months it will have to add three times as many. This spring, four new bomber plants and two new engine plants will be put into operation, with their accompanying quota in labor requirements. To all these, some time in the summer, will be added still more bomber, engine and propeller facilities. This will offer a great challenge in recruiting and training, and to meet it the Government will have to call on the private schools.

It has already become apparent that the shortage of trained mechanics is slowing down airplane production. Bureau of Labor Statistics' reports show that the industry has consistently been several thousand men short of the number of trained workers needed. The scarcity of skilled men has been met, in some measure, by the activities of the manufacturers in training workers—at a cost of from $500 to $1,000 a man.

One manufacturer reported that 95 per cent of his workers had no previous factory experience and had to be trained. Another reported that he had hired 60 per cent of his employes within the previous six months, most of whom had to be trained. The shortage of new men is putting a burden of overtime on the veteran employes. The North American Aviation Corporation reported that five hours overtime was being worked regularly.

These figures give some indication of the growing crisis in the industry. Already the efforts of the Government and the manufacturers to provide the necessary workers have fallen far behind the demand. And we are assured that the demand will double or triple every month!

Outside the factories, there is another growing shortage of mechanics. You must bear in mind that all of these planes which are being built must be serviced. Most of them are going into Army use and the Army is taking steps to train the mechanics to handle them. But thousands of planes will be sent abroad. They will go to England and Russia, to Asia and Africa.

Experience has shown that American planes, without American mechanics, are not of much value to foreigners. The Germans seized scores of American planes when they invaded France. These planes had never been off the ground—because the French didn't have the mechanics to keep them flying. As our Lend-Lease aid swells, the demand for civilian mechanics to go with them will grow. It will be pointed out that there is no use in sending planes, if we don't send men who know how to service them and keep them in the air. Already, the English have indicated that they would welcome 15,000 American mechanics.

As our air services extend into South America and South Africa, we are building bases which must be manned by hundreds of trained men. We don't have them to spare now. Where are we going to find them, unless we immediately begin to train skilled, all-around mechanics? How are we going to keep up civilian flying in this country, unless we have more mechanics? The shortage is being felt in civilian flying already. In 1940, there was an increase of 182 per cent in civilian pilots over the year before; there was a 59 per cent increase in civil aircraft, but there was an increase of only 24 per cent in the number of licensed mechanics. There is every reason to believe that the shortage of mechanics in civilian flying has grown more severe since.

When we consider the vital need for trained mechanics, it seems ridiculous that the private institutions which are organized and ready to turn out thousands of these skilled workmen are being given no work to do. Indeed, in the position these schools find themselves in now, they may well be put out of business and their usefulness lost to the country. For the competition of the free Government-financed public school courses is proving too much for them. The students who would ordinarily come to them for thorough A. and E. training are enrolling in free schools, where they pick up some small skill that will get them a job quickly.

The Civil Aeronautics Authority is in a position to utilize the facilities of these schools quickly. That agency has made a fine record in its training work and, matched with the fine record of the approved schools, should be able to perform a real service.

The time is short. Every day the bottleneck grows tighter and tighter. Since the introduction of the measure, I have been greatly gratified by the letters which have poured in from men all over the country in the aviation field. They have been unanimous in endorsing the bill and urging its speedy passage. It is to be hoped that action can be taken in time to provide a real, large-scale training course which will produce the mechanics we need. We must not allow our program to fail now for the lack of skilled hands.

END

Training in aircraft instrument maintenance also is available from private schools.

This British "Hurricane" fighter has four 20 mm. rapid-fire cannon mounted in wings. Another model has 12 .30 caliber guns.

FIREPOWER

by DONALD G. SMITH

Armament Engineer, Grumman Aircraft Engineering Corporation

The modern warplane is virtually a "flying gun platform" with cannon, machine guns and armor.

THE present conflict has placed the airplane in its rightful position as a primary striking weapon and defensive unit. Germany has forced this recognition, to the point where air forces are as important as armies and navies. Today, the army or navy operating without air co-ordination becomes the target of enemy aerial units. As oft repeated, the best defense against hostile aircraft is a superior defensive air force. The "superior" air force is the one having superiority in numbers, equipment, personnel and organization.

In regards to superior equipment, the urgent demand for more firepower has been most frequently brought to public attention. Firepower means as much to the tactical airplane as the size and number of guns means to a battleship; and, in combat, can be more important than speed and performance. Actually, this word "firepower" may be applied to briefly describe an airplane's tactical qualifications. However, this article accepts the popular version and deals only with the armament units.

Increased firepower is a direct outgrowth of the recent increases in speed, caused by the necessities of war—the faster the target, the more shots per second required. Downing an airplane with gunfire is not as simple as many fiction stories may lead us to believe. We must remember that the need for increased firepower is due, mainly, to the difficulty of keeping a target in the gunsight long enough to place an effective burst of gunfire.

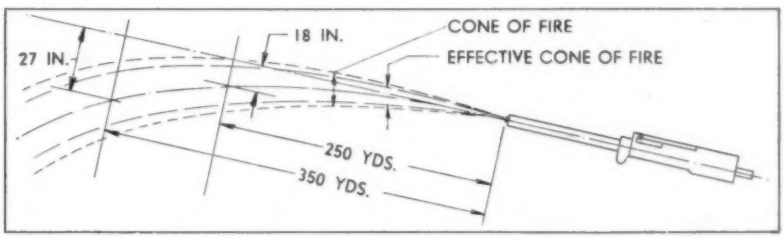
At the outbreak of the present hostilities, U. S. aircraft were woefully lacking in required firepower. Standard armament for fighter craft, at that time, consisted of one .50 and one .30 caliber machine gun, with about 300 rounds of ammunition each. Such planes as the Consolidated PB-2, Northrop A-17, Republic P-35, Curtiss P-36 and Boeing F4B-4, to mention a few, became obsolete overnight, as World War II ushered in the era of winged "gun-platforms." Luckily we had planes, like the Bell P-39, Curtiss P-40, Grumman F4F-3 and Boeing B-17, easily adapted to the new tactical requirements and capable of forming a backbone for our new air forces. Much credit must be extended to the various aircraft manufacturers who had the foresight to realize the importance of firepower, long before the demand became apparent.

The past two years have seen the P-35, P-36, B-17 and F4F-1 develop into the Republic P-47, P-42, Boeing B-17E and Grumman F4F-4 respectively, as our air arms kept in stride with European developments. Our American industries are, once more, proving their ability to conform with, and surpass, changing ideas and uniting in the effort to meet the demands required by existing conditions.

In actual firepower, the machine guns form the mainstay, around which supporting units are installed—those being bombs and cannons. Armor plate, while being more of a protective measure, affects the firepower indirectly by limiting the target vulnerable to gunfire.

The average machine gun is capable of firing from 600 to 1,200 rounds of ammunition per minute, depending upon the strength of the drive spring, caliber, ammunition, temperature, synchronizing system (if used) and the design and location of accessory equipment (feed and ejection chutes, ammunition boxes, etc.). However, "rate of fire" must not be misconstrued, as machine guns are rarely fired for a full minute. Machine guns easily overheat, causing premature and automatic firing, damaged barrels and malfunctions (jams). An air-cooled gun should not be fired in bursts exceeding 25 shots when on the ground and 125 while in flight. Due to variations between guns, ammunition and mounting methods, the resultant line of gunfire is conical (Figure 1) and may be compared to a spout of water emitted from a hose under pressure. "Effective pattern" is defined as being the diameter of a circle in which 85 per cent of the shots fired will hit at a given distance (Figure 2), amounting

Figure 1.



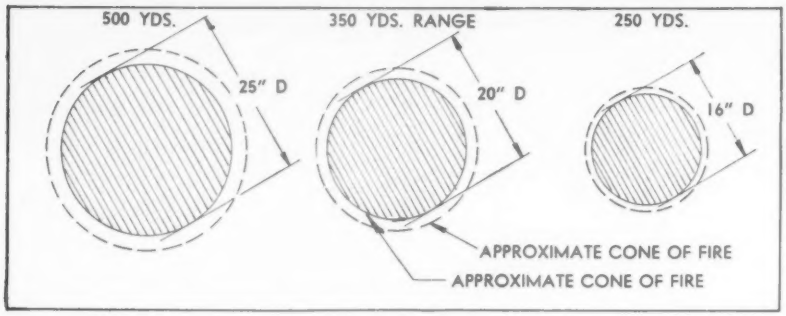


Figure 2.

to about a 12-inch diameter circle at 250 yards range, for a typical gun. Muzzle velocities are usually in the neighborhood of 2,500 feet per second and vary with the type of gun and ammunition. A large caliber shell may have a higher muzzle velocity than one of smaller caliber, but will slow down sooner because it offers more wind resistance. The arc of trajectory, an important factor in "mixed" installations of machine guns and cannon, will approximate two mils or a drop of about 18 inches at 250 yards.

The foregoing figures are, necessarily, approximate and will not hold true for any one machine gun, since too many variables are concerned in the calculations. It is regrettable that a more conclusive description of machine gun and cannon firing data cannot be published, but their listing as "confidential" implies discretion.

Structurally, an airplane must be capable of absorbing the recoil and gravity loads imposed upon it by the armament. Recoil and counter-recoil design loads approximate one ton for a .30 caliber machine gun, and about two tons for the .50 caliber type. Of course, these loads are dependent upon the gun mounting and adjacent structures. Illustratively, when a rifle is held properly and fired very little recoil (kick) is apparent, as the human body forms an excellent shock absorber. However, the same rifle, fired when the rifleman has his shoulders and back against a wall, will cause considerable "kick" and an exceedingly sore shoulder. Likewise, an airplane structure must be sufficiently rigid to prevent excessive gunfire dispersion, but flexible enough to absorb recoil loads. With the advent of multiple gun installations recoil adapters are receiving wide acclaim, as they absorb a large percentage of the recoil loads.

When aircraft are equipped with bombs, the structure and fittings must be strong enough to carry not only the bombs, but many times the weight of the bombs, to sustain gravity maneuvers.

One of the most important considerations encountered in an aircraft armament installation is the design for maintenance and accessibility. Aircraft armament must be capable of being easily checked, repaired and reloaded under adverse conditions, such as on a reserve air field or a carrier deck at night and possibly without the aid of any lights. This requires exceptionally good access and simplified design of all accessory equipment and assemblies. Access doors and panels must be easily and quickly detachable, providing a maximum of accessibility, with a minimum number of doors. It is often wise to fasten removable panels to the airplane with hinges or light chains, to prevent their being damaged or lost (on aircraft carriers, the wind may blow loose parts overboard). In addition to the loading of ammunition boxes, gun barrels must be removed after each tactical flight for inspection and replacement.

The location of ammunition boxes, in respect to the gun, can be as important as the number of guns. The recoil action of a Browning machine gun is used to cock the bolt, eject the empty cartridge case, eject the belt link and to pull the ammunition belt into the feedway. Therefore, an excessive distance between the gun and ammunition box means additional friction to be overcome by the gun feeding mechanism. Increased gravity loads, during aerobatics, may decrease the rate of fire or, when the friction and belt load becomes too great, cause com-

(*Continued on page* 90)

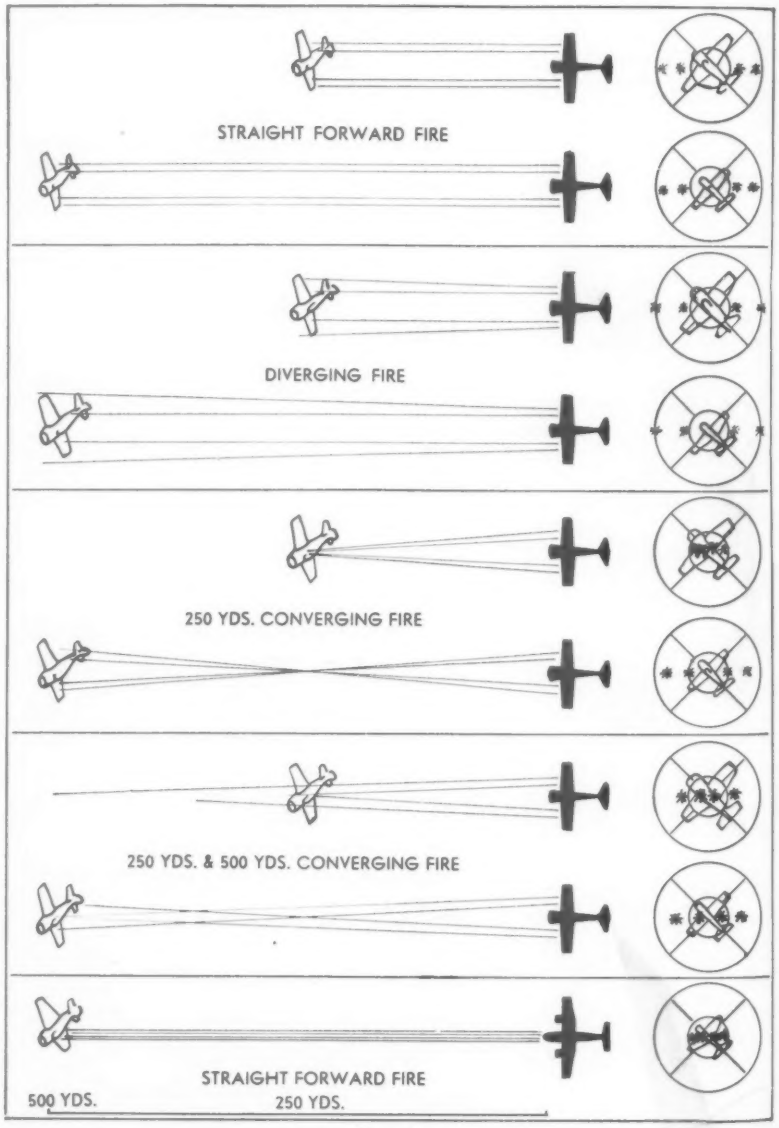


Figure 3.

Planes Abroad

ACCORDING to one RAF officer who recently returned from Libya to his office in Washington, D. C., American-built aircraft are playing a vital part in the desert fighting. He said four makes of U. S. aircraft were in the thick of the battle and one type was being held back as a "clincher."

Already in the fighting, for the most part in large numbers, are the Curtiss *Tomahawks*, Brewster *Buffaloes*, Martin *Marylands* and Boeing *Flying Fortresses*. In reserve and being prepared for action, the officer said, is the Martin *Baltimore*, a larger, faster and more powerful version of the *Maryland*.

"American craft in Libya are performing beautifully," the RAF officer declared. "They are fast and rugged and hard-hitting. Certainly they are more than a match for the enemy equipment."

The observer said that *Tomahawks* and *Buffaloes* have repeatedly beaten off enemy bombing attempts, both performing exceptionally well in the dust-filled air that has reduced the efficiency of other fighting planes. The *Marylands*, he said, have been used for reconnaissance as well as bombing and strafing of enemy troop concentrations.

Big four-engined *Flying Fortresses* have carried out many successful long-range bombardments of strongly-held enemy positions. These big bombers, it was explained, are available in Libya in smaller numbers than any of the other American types and, being an early model, lack certain defensive armament possessed by later *Flying Fortresses*. Despite this, the RAF officer reported, the big bombers are causing the enemy plenty of trouble.

Particularly potent were American planes in attacks on Axis tank columns. On one occasion in the Sidi Omar region, it was revealed, nine British pilots in *Tomahawks* destroyed at least eight Nazi tanks in diving attacks which also rendered a number of other tanks useless. In some cases the planes dived so close to the moving tank columns that pilots reported they could actually spot vulnerable points in the tanks' armor.

According to American correspondents in the African scene, the American-built warplanes have been greatly responsible for the defeat of the Axis forces in the desert fighting.

END

Licenses

PREPARED as a special bulletin for FLYING, the following monthly statistics were released by the Civil Aeronautics Administration:

	Jan. 1 1942	1941
Pilot certificates of competency	100,787	65,099
Airline transport certificates of competency	1,587	1,393
Student pilot certificates	96,731	87,876
Glider pilot certificates of competency	164	138
Student glider pilot certificates	514	516
Mechanic certificates of competency	14,047	11,177
Parachute rigger certificates of competency	618	444
Certificated aircraft	24,836	17,000
Certificated gliders	65	39
Ground instructors certificates of competency	4,815	1,948
Air-traffic control-tower operators certificates of competency	498	248
Aircraft dispatchers certificates of competency	420	375

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

The Aircraft Owners and Pilots Association, with Service Headquarters in the Transportation Building, Chicago, Ill., is a non-profit organization formed and composed of non-scheduled aircraft pilots and/or owners exclusively. *The AOPA operates with a full-time professional staff and is the largest group of civilian pilots in the world. This column is devoted to news of importance to AOPA members and is of a non-confidential nature.**

THE AOPA News has not appeared in recent special issues of FLYING because all regular departments were "retired" for those months. We are back on the line-up again however so AOPA members and friends can keep in touch with AOPA activities. The eight page AOPA Section which is sent to AOPA members only was not disturbed by the publication of these special editions of FLYING.

AOPA Going Up or Down?

What is the membership outlook for AOPA; pretty bad these days maybe? "No," says H. Taylor, AOPA Registrar. As a matter of fact the grounding order which followed the Pearl Harbor attack proved to be quite a boom to the membership department. Pilots, at long last, awakened to the fact that AOPA's repeated warnings for the past two years were not "membership getting tricks" but the real thing.

Warnings Went Unheeded

In reviewing some of our efforts in the past to bring all civilian pilots into a solid group we dug up some of our mailing efforts—some of the many mailings sent out over a year ago. The following one was sent out on a Western Union blank. The returns were barely enough to pay for the postage. Pilots couldn't then be shaken into the realization that *their future flying depended upon organization*—upon the AOPA! Here is the ill-fated message flashed out from AOPA headquarters on September 23, 1941:

"URGENT WE HAVE YOUR IMMEDIATE SUPPORT TO PREVENT NON-SCHEDULE FLYING FROM BEING CURTAILED IN US STOP AOPA FIGHTING TO PRESERVE YOUR RIGHT TO FLY STOP MUST HAVE YOUR CO-OPERATION AND PERSONAL PARTICIPATION TO BE IMMEDIATELY EFFECTIVE STOP . . . YOUR AFFILIATION AND YOUR FUNDS NEEDED IMMEDIATELY TO CORRECT THREATENED CURTAILMENT STOP TOMORROW MAY BE TOO LATE STOP REGISTER WITH AOPA NOW."

Message Still Holds

The same message goes today. There is more reason for pilots banding together *today* than there ever was before. Most pilots realize this and our membership increase bears this out. There are still a few who are reluctant to join in our efforts. This can be accounted for in one of two ways; either the non-members do not know of the work being regularly accomplished by AOPA or they are just letting the member AOPA pilots carry the load for the whole pilot fraternity. In the first instance correction can be easily made. All non-member pilots are requested to communicate with any of the 178 local AOPA Units or with the National Service Office, Transportation Building, Chicago, Ill. Complete details on the active program being conducted in behalf of AOPA pilots will be promptly forwarded.

What About the Slackers?

The other group—those who know of AOPA's work but let the members carry the load, thereby receiving the benefits without contributing their time or money present a much more difficult problem. We are sure that only a very small percentage of these pilots are actually "slackers" and that *most of them need to be contacted personally by an AOPA pilot* and told of the work at hand and how the pilot may, through the AOPA, strike a maximum effort to "Keep 'em *ALL* Flying."

Regarding Guard at Airports

Hundreds of requests for information regarding the 24 hour guard requirement at airports have been received. The application of this requirement is, in general, uniform throughout the United States. The CAA requires an active *armed* guard. This means that a sleeping resident guard is not sufficient. They want him "on the hoof" and wide awake to prevent tampering, trespassing and unauthorized activities at the airport. Operators who are having difficulty meeting the "armed" requirement of the regulation are urged to contact the local or county police officials and endeavor to have their watchmen deputized. Most sheriffs' departments have certain maximum quotas but in most cases "special deputies" may be sworn in at the discretion of the sheriff's office. Deputization in most States gives the right to carry firearms . . . and thus the problem is solved in this manner without the necessity of depending upon assignment of

(*Continued on page* 111)

* The views and statements of opinion contained in this column are those of the Aircraft Owners and Pilots Association and not necessarily those of Flying and Popular Aviation. This column is edited by the staff of AOPA for its members and other interested parties. Special releases of a more confidential nature are additionally sent each month to all registered members.

Plane Planters

by S. R. WINTERS

This New Standard biplane can plant several acres to grass in a few minutes.

Sowing seed by plane overcomes inaccessibility of mountain ranges, reclaiming grazing lands for roaming herds of cattle.

OUT in the Squaw Creek Hills, in Gem County, Ida., that section of the country where a man's wealth is counted in terms of ewes, lambs and white-faced steers, airplanes are being used by the Federal Government to sow grass seed in mountainous areas or other sections of wastelands too inaccessible to be reached by ordinary machine or hand-sowing methods.

Throughout large sections of the middle and far west, forest fires, timber operations and subsequent erosion have cut into the terrain so disastrously that stock raisers in those areas have come to look on a clump of green bunch grass as manna from heaven and the airplane and its pilot as the dispensers of the heavenly blades.

In rehabilitation efforts, 2,500 acres of rough, mountainous land in the Squaw Creek erosion area have been planted with grass seed sown from a 220 h.p., three-seated cabin plane, remodeled to make room for a seed-hopper with the seeding mechanism operated by the pilot from the cockpit. Before actual seeding, test flights were made with sawdust to determine the feasibility of the plan. With an inspector on the ground to flag the plane when the wind was unfavorable, over 6,000 pounds of seed were distributed over the area in 10½ flying hours. However, it took the better part of three days to complete the job, allowing for wind conditions, early darkness and time consumed in reloading and servicing the plane.

Flying 80 m.p.h., 300 feet above the steep, jagged land, the plane seeded swaths of land 100 feet wide. In order to demonstrate the approximate distribution of the small seeds, sheets of cardboard 12 x 18 inches were covered with ordinary machine grease and placed 135 feet apart, diagonally across a 700-acre tract. It had been estimated that if there were even distribution of the five pounds of seed sown per acre that each card should catch and retain 21 seeds. A check after the seeding flight showed that the average number of seeds on each card was 23. Seeds were sown from two directions. Cross-seeding was done at right angles to insure uniform distribution. After each time through, the ground crew marked the edge of the seeded area and paced off 50 feet. The next trip was then made directly over the flag. It was impossible to predict the seed fall when the wind was strong due to the tendency of the seeds to carry. Consequently, flights were made only under the best of flying conditions. While flag waving and bobbing the plane permitted communication of a sort between the pilot and ground crew, it is believed that radio will be used for transmitting instructions in future seeding projects.

The cost of seeding mountainous and erosion-blasted areas from the air averages $1.23 an acre, which is much less than it can be done by hand. This amount includes the cost of seed, while labor for the old method is from 50 cents to two dollars an acre, plus the cost of seed. Ranchers in the Squaw Creek Hills, who are among the largest stock

raisers in the United States, are taking an active interest in the experiment as an economical method of reclaiming their lands and are eyeing the future by definite glances skyward.

If the proverb, "As ye sow, so shall ye reap," comes true in the cattle country, there will be more than "gold in them thar hills." There will be lush, green grass and a definite place in our economic structure for the aerial seed-sower.

The Squaw Creek country, with the airplane serving as a means to reach the inaccessible sections and insure a better vegetative covering, now shows promise of being a valuable range and habitat for game. The elimination of burnt and cut-over areas will mean the conservation of water, the control of devastating floods, and valuable material increases to its owners through better ranges and stock.

Planting grass seed from airplanes over forest burns has been accomplished successfully in the western part of Washington, Oregon, Idaho, and elsewhere throughout the West by the United States Forest Service. Experiments were so successful in the Siskyou National Forest that lumber companies in the section expressed willingness to buy the seed and rent planes to reseed their cut-over lands.

Even larger projects have been carried on in Coos and Curry counties in Oregon. After particularly disastrous fires, 55 leading ranchers pooled their resources to buy seed in a co-operative effort to reseed some 30,000 acres of devastated range by airplane. However, bad weather and flying conditions eventually reduced the reseeded area to 15,000 acres.

A Stearman biplane, equipped with a 525-h.p. Wright *Cyclone* engine, capable of maintaining cruising speed of 120 m.p.h., was used in these vast operations in Oregon. Fuel was consumed at the average rate of 40 gallons of gasoline and one and a half quarts of oil per hour.

This almost impenetrable burnt-over forest was quickly replanted by a plane duster.

Two canvas hoppers were used on the plane. These hoppers were capable of carrying 500 pounds each of average seed mixtures and 800 pounds of fine varieties. Recurved 14-inch metal vents, with three-inch openings, were at the bottom of each hopper. The vents had baffle plates regulated by set screws by which the size of the openings could be regulated. Vents were pilot-controlled by cables and levers from the cockpit.

The principle of air seeding is simple. Movement of the plane through the air and wind created by the propeller blows seed outward as it slides from the hopper.

While tracts as small as 40 acres have been seeded in this manner, it has been found that tracts containing 100 acres or more are seeded with more success and more economically. On smaller tracts operations are not as efficient due to the tendency of the seed to drift.

In order to insure proper distribution, it was necessary to make test flights at various speeds and heights. It was found that seven or eight pounds of seed could be spread evenly by flying from 100 to 105 m.p.h. at an altitude of 500 feet. August and September are the months found most suitable for air seeding.

(*Continued on page* 113)

Controlled from the cockpit, this propeller operates seed dispensing mechanism. It can be stopped by a brake in mid air.

Payload of this Stearman biplane, either in seed or "dust," is one ton. This ship seeded 15,000 acres in Oregon recently.

The CAP

by EARLE L. JOHNSON

Executive Officer, Civil Air Patrol; Director of Aeronautics, State of Ohio

Our vast reservoir of private flyers and civil aviation personnel will be mobilized. U.S. plans national defense activity to "Keep 'Em All Flying."

INDIVIDUAL flying for fun can hardly be tolerated by a nation at war, desperately seeking to conserve for its fighting forces the vital materials entering into the manufacture, operation and maintenance of aircraft. Therefore, prepare to adapt your flying ability to the demands of national defense. There may be no alternative, other than to quit flying.

That, in brief, sums up the situation facing the private pilot today as the United States, alone of all warring nations, seeks through proper control to maintain civil flying on a semi-military basis and thus utilize the vast reservoir of almost 200,000 certificated and student pilots listed by the Civil Aeronautics Administration.

There are several ways in which the private flyer and non-flying civilian personnel can enroll in the nation's voluntary skyline of defense. Most comprehensive in scope and far-reaching in tactical and administrative planning is the Civil Air Patrol. Organized under the Office of Civilian Defense, the CAP is headed by Maj. Gen. John F. Curry, assigned to this responsible post by the Air Corps.

To enlist in CAP it is necessary that you submit your application accompanied by a standard FBI card and three full-face pictures 1½ x 1½ inches. The necessary papers and instructions may be obtained from Civil Air Patrol wing commanders, Civil Air Patrol group commanders, AOPA, NAA, airport managers and State aviation Officials.

The point to be emphasized is that you should act without delay. Only by strict adherence to all emergency rules and regulations can private flying hope to retain any status during the war period and be spared the complete grounding accorded non-scheduled civil flying in all other warring countries.

Maj. Gen. John F. Curry

In considering the demands which may be made upon its members, an early announcement pointed out that a well-organized and trained CAP could render the following specific services:

Guarding airports. All airports on which operations are sanctioned would have to be guarded day and night by experienced personnel. There are more than 2,000 airports in the United States upon which no military activity is at present located.

The demand for courier service under war conditions may utilize many pilots and aircraft capable of cross-country navigation.

The observation patrol of back-country area or long reaches of uninhabited coastal area may be desired by the military establishment.

The towing of aerial gunnery targets might be done by experienced civil airmen, thereby releasing military pilots for more important duty.

Ferry service for training and observation types of aircraft can be done by the more experienced pilots.

Under war conditions many military ships will land in emergency at civil airports. Mechanical personnel to assist at such times will be at a premium and regular field crews could be augmented by CAP members.

CAP personnel, familiar with all types of aircraft, can assist the air raid watchers in learning to identify aircraft as friendly or enemy.

State and local defense councils will have much executive travel and courier service to request.

The intimate familiarity of a CAP squadron with its home terrain may furnish valuable information to the military establishment.

Patrolling for highway traffic control under possible evacuation conditions may be a necessary service to state and military police forces.

Searching for military aircraft forced down or crashed in out-of-the-way areas may relieve military personnel and ships of this responsibility.

It is important to stress that other than pilots may enroll in the CAP. In clarifying the qualifications, CAP lists:

1. Any citizen pilot of good character, certificated by the CAA in the grade of private pilot or higher grade.

2. Any citizen of good character, holding a Government certificate for any skill or experience related to aviation, such as A. and E. mechanic, control tower operator, radio telephone operator, etc.

3. For auxiliary duty: any citizen of good character who will volunteer for clerical work, driving of cars or ambu-

A STATEMENT TO CIVILIAN PILOTS BY THE AOPA

The flying and technical skill of all civilian pilots must be applied quickly and efficiently to the national and civilian defense problem. Pilots of the AOPA have been exposed to this problem for many, many months. They, and their fellow pilots are urged to make available now their equipment and their flying experience for the task at hand.

Regular, everyday flying by civilian pilots should be purposeful flying. Know the terrain over which you fly. Follow out your flight plans with meticulous accuracy. Memorize the location of restricted areas—and give them a wide berth.

The board and staff of the Aircraft Owners and Pilots Association consider the national defense of our country the first item of business. Civilian pilots, clubs or groups desiring advice or assistance are invited to utilize the facilities of the AOPA.

J. B. Hartranft, Jr., Executive Secretary
Aircraft Owners and Pilots Association.

lances, watchmen, first-aid instruction or kindred service.

4. For apprentice duty: any citizen of good character who will undertake instruction under the training program of the CAP.

The minimum age requirement for CAP duty has been set at 16, while for flight duty the minimum is 18 years of age. However, all applicants under 21 must present with their application a signed letter of permission from their parents or guardians. All of the enrollment particulars apply to women as well as to men.

The training directive of the CAP calls for familiarization with military and Naval tactics, discipline, military courtesy and rank, technical flight operations, navigation and meteorology, air raid warning service, first aid, co-operation with other defense organizations and kindred subjects.

Col. Harry H. Blee, who heads the operations and training division of the CAP, has outlined the general scope of his plan of action as follows:

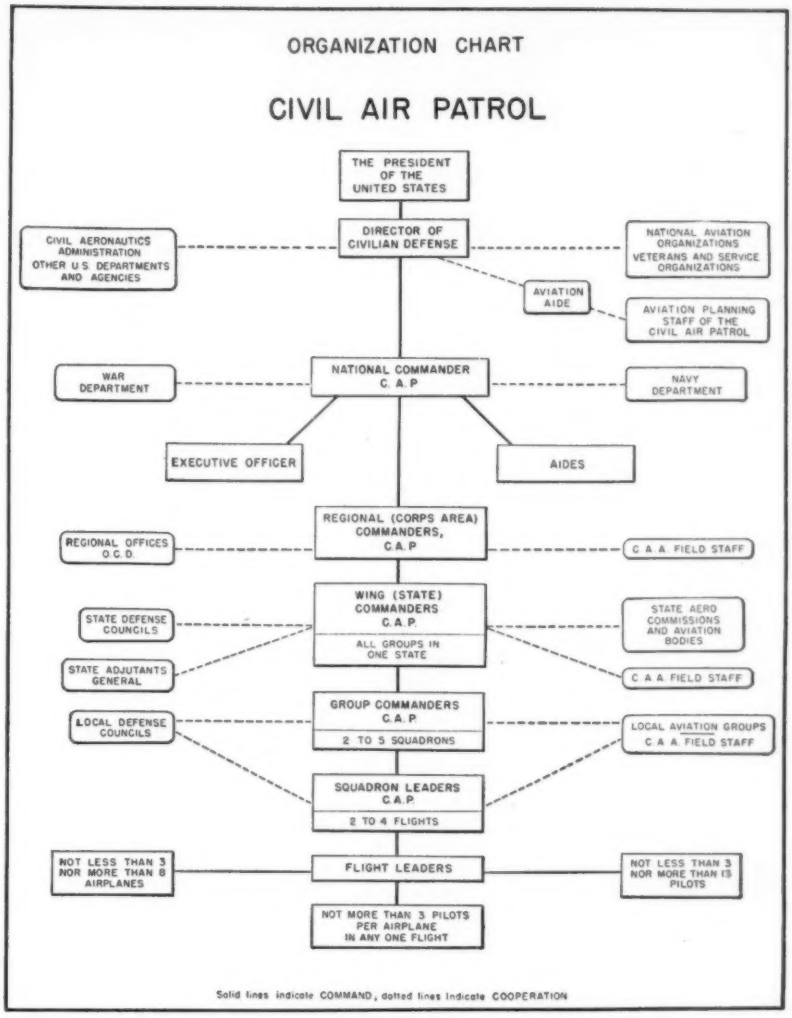
"The fundamental basic purpose of our training program, namely, the objective toward which we are striving in setting up this program, is to give the members and organized units of the CAP the training necessary to fit them for the various duties, responsibilities and missions which they will be called upon to perform, and thus to put the CAP in a position to render maximum service as an auxiliary to the various defense agencies and activities of our country in carrying out this national defense program.

"As to the training procedure, this program has, of necessity, to be carried out by voluntary instructors. Each unit commander, assisted by his training and operations officer, will have to interest himself in enlisting the services of qualified instructors for the various subjects and various types of instruction."

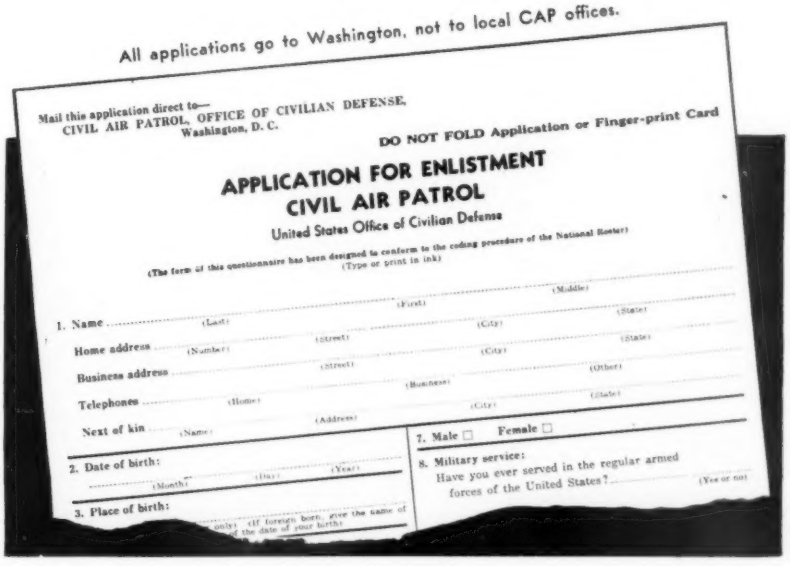
The CAP has formed a national advisory committee on training directives. This group includes representatives of the Army Air Forces, Naval Bureau of Aeronautics, CAB, CAA and other interested Federal agencies such as the Office of Public Education, as well as from various private groups active in civil aviation.

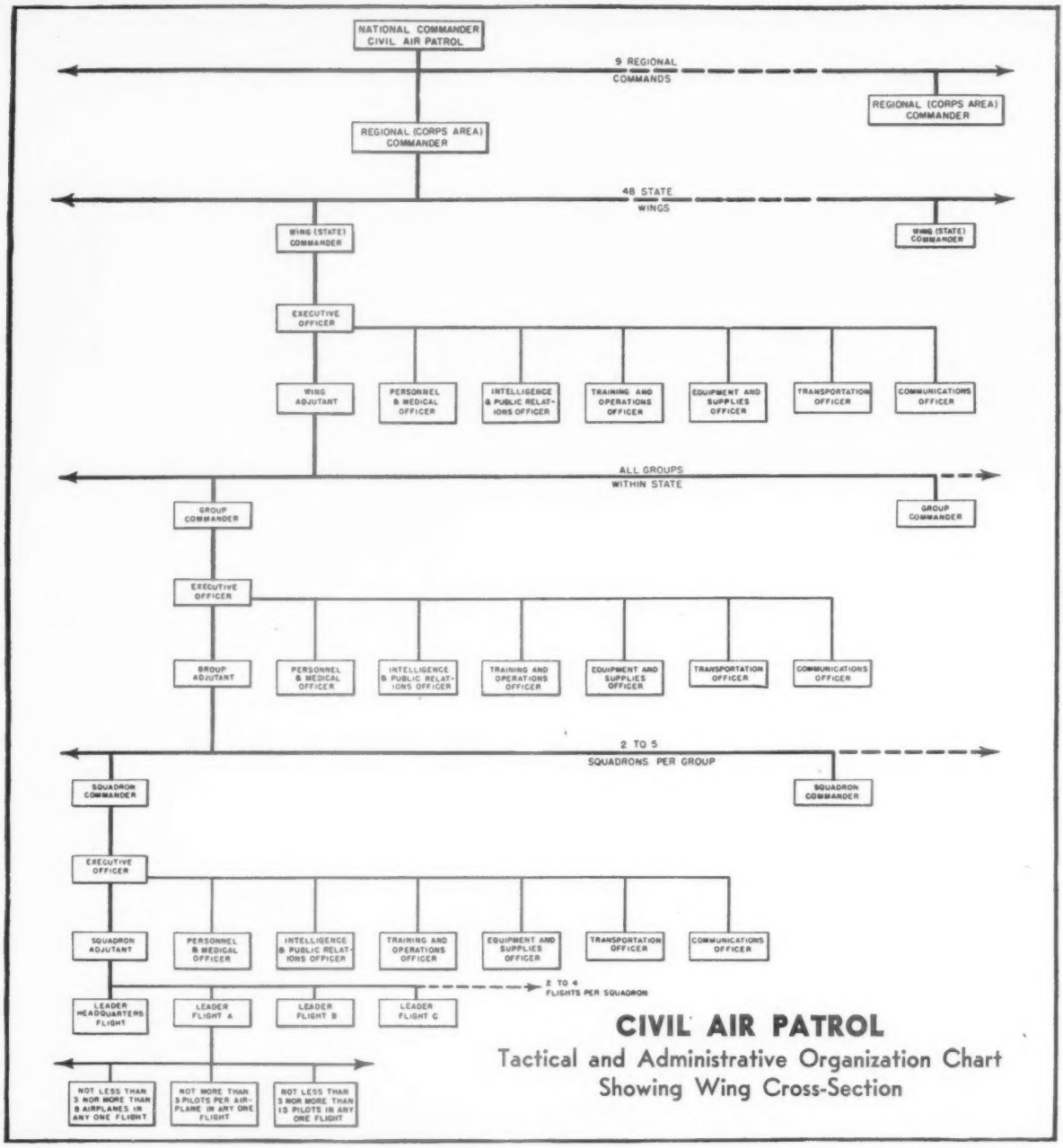
The first training directive will concern military courtesy and discipline, Colonel Blee announced. He stated that "if CAP is to do its job, it must not only be made up of carefully selected and well-organized personnel, but its various units and individual members must be thoroughly disciplined, so that when a mission is assigned we know that mission will be carried out with precision, accuracy, intelligence and a pride in the organization, and with that cohesion attained only through the training that comes as a result of a carefully disciplined and well-organized body.

"The second course of instruction will have to do with infantry drill regulations, as applied to foot troops without arms. This will add greatly not only to the precision of the units, but the ease in moving a unit from point to point.


ORGANIZATION CHART
CIVIL AIR PATROL
THE PRESIDENT OF THE UNITED STATES
DIRECTOR OF CIVILIAN DEFENSE
CIVIL AERONAUTICS ADMINISTRATION
OTHER U.S. DEPARTMENTS AND AGENCIES
NATIONAL AVIATION ORGANIZATIONS
VETERANS AND SERVICE ORGANIZATIONS
AVIATION AIDE
AVIATION PLANNING STAFF OF THE CIVIL AIR PATROL
WAR DEPARTMENT
NATIONAL COMMANDER C. A. P.
NAVY DEPARTMENT
EXECUTIVE OFFICER
AIDES
REGIONAL (CORPS AREA) COMMANDERS, C.A.P.
REGIONAL OFFICES O.C.D.
C. A. A. FIELD STAFF
WING (STATE) COMMANDERS C. A. P.
ALL GROUPS IN ONE STATE
STATE DEFENSE COUNCILS
STATE ADJUTANTS GENERAL
STATE AERO COMMISSIONS AND AVIATION BODIES
C. A. A. FIELD STAFF
GROUP COMMANDERS C. A. P.
2 TO 5 SQUADRONS
LOCAL DEFENSE COUNCILS
LOCAL AVIATION GROUPS C. A. A. FIELD STAFF
SQUADRON LEADERS C. A. P.
2 TO 4 FLIGHTS
NOT LESS THAN 3 NOR MORE THAN 8 AIRPLANES
FLIGHT LEADERS
NOT LESS THAN 3 NOR MORE THAN 15 PILOTS
NOT MORE THAN 3 PILOTS PER AIRPLANE IN ANY ONE FLIGHT
Solid lines indicate COMMAND, dotted lines indicate COOPERATION

Close tie-in with other defense units is shown in CAP setup.


All applications go to Washington, not to local CAP offices.
Mail this application direct to—
CIVIL AIR PATROL, OFFICE OF CIVILIAN DEFENSE,
Washington, D. C.
DO NOT FOLD Application or Finger-print Card
APPLICATION FOR ENLISTMENT
CIVIL AIR PATROL
United States Office of Civilian Defense
(The form of this questionnaire has been designed to conform to the coding procedure of the National Roster)
(Type or print in ink)
1. Name
Home address
Business address
Telephones
Next of kin
2. Date of birth:
3. Place of birth:
7. Male ☐ Female ☐
8. Military service:
Have you ever served in the regular armed forces of the United States?



"The third training directive, which is required of all members, will be familiarization with the local defense organization and set-up—what the agencies are, how they function, their duties and how they are organized, where their different stations may be reached in case of emergency.

"The fourth directive will be a special first aid course for civilian defense. This course has been developed by the Red Cross especially to cover subjects and training which must be practiced in a nation at war.

"The fifth general directive will impart a familiarization with the national defense organization. There will be chapters on the Army, Navy, Army Air Forces, OCD, and a basic chapter on the fundamentals of leadership and of all military operations, with emphasis on the proper exercise of command."

When members of the CAP have completed the general courses, they pass into more specialized studies pertaining to the particular activity or duties to which each is assigned. For instance, flying personnel will be fully trained in terrain familiarization within a radius of from 20 to 50 miles of the base from which they normally operate. There will be courses on observation and reconnaissance for both pilots and observers. Other specialized courses will cover meteorology, navigation, and communications; mechanical personnel will be trained in operation, maintenance and repair problems, as well as in special services required for military equipment.

The fundamental plan of CAP training is predicated on the theory that people in aviation now are devoting some given amount of time in flight or other aviation activities at their own expense. The CAP will provide the foregoing training directives which, if followed, should raise the level of their skill during the same period of time that they have heretofore used in more or less aimless flying or other activity. There is no present intention of providing gasoline, aircraft or other financial or material aid in the training period. However, when a Governmental

(*Continued on page 73*)

Combat use of Lockheed P-38's at high altitudes is possible because Milo Burcham (in cockpit) and other test pilots conquered blackout.

TESTING THE P-38

by EDWARD CHURCHILL

Checking this fast plane's performance is only one phase of pilot's job. Equally important is data on human system's reaction to high flight.

MILO BURCHAM, second Lockheed pilot to fly the P-38, sensational interceptor considered to be one of the fastest planes in the world, is handling one at better than 30,000 feet over Southern California. He is on a routine test flight, reporting by two-way radio to the manufacturing company's ground station at Burbank.

For 30 minutes before his flight into the substratosphere he has exercised to drive the nitrogen from his body and thus avoid "aerial embolism." At the same time he has been inhaling pure oxygen to get rid of that other disease associated with extremely high flight, "anoxia," which means lack of oxygen.

He has been pulling on his oxygen tank since take-off. Now, as he starts talking into his microphone, he takes a last heavy drag to bolster him up. He feels in good shape as he reads his dials, makes his routine report as fast as he can read to the ground station. Carburetor temperature, outside air temperature and other facts which make up a detailed engine performance report roll from his lips.

Then—"manifold pressure—" he says and glances at the biggest instrument on his panel. He finds that he can't see it—that he is suffering from the first symptom of "anoxia," and knows that he must do something about it quickly. He is at what is known as a "lethal" altitude, which means that if a pilot passes out completely he may possibly never regain consciousness before he crashes more than six miles below. Weakened by the simple processes of thinking, looking and talking, he still has enough strength left to move the stick forward gently. He starts a fast descent as he goes back onto his oxygen.

Soon his vision clears. He climbs back up to where he was and takes up his recitation where he left off.

Such experiences are rare when testing the P-38 at high altitudes, but they happen. And the pilots who fly into the danger zone are prepared. It isn't the

His system purged of nitrogen, pilot must breathe pure oxygen as guard against blacking out.

airplane's fault. It handles perfectly. It's the altitude. Burcham had this experience early in the high altitude testing business. He told the others. They're careful because they know it isn't smart to take chances. And it happens fast. First they're reading their instruments. Then they're talking. Then their sight fails them. And then they do something quickly, these flying guinea pigs who are finding out about unexplored altitudes. They smile sardonically at the layman, who gets his figures about flying at 30,000 to 40,000 feet, and says:

"Gee, it must be pretty up there."

Talk to the men who fly the P-38 and they'll tell you it's the sweetest job they ever handled. In fact, its reasonably low landing speed, considering its terrific top speed of better than 400 m.p.h., is uncanny.

Lewis D. "Swede" Parker, also running tests—Lockheed worked night and day to improve it and the job of making it better never will be quite complete—was another Lockheed man to fly it. He says:

"As far as landing and taking off are concerned, the ship is easier to play with than a DC-3. My bet is that if a man with 200 to 300 hours on light ships got a thorough ground coaching he could get it up, around and down without hurting either himself or it."

Lockheed's test pilots, entrusted with the development work on the fast ship, have a long list of "don'ts", however, when they tell you about going 400 m.p.h. and better. Again, it isn't the ship which is to blame—it's the pioneering in speed and altitude that inspires their counsel to take it easy. They will tell you to make no abrupt maneuvers of any kind. If you are inexpert you are bound to get into trouble. At better than 400 m.p.h. any quick change of direction will "black you out."

Medical report of pilot's condition is compiled after substratosphere flights.

Ralph Virden, one of the original P-38 test pilots, said:

"The speed fools you constantly. You go through cloud levels so fast you scarcely know it. You may be flying along noting your instruments and jotting on your knee pad. You know there are clouds a few miles away. Then, whoosh! You're into 'em. The cockpit goes dark for a second and then you're out again. If the clouds were around mountains, maybe you wouldn't be out."

Burcham, who has developed into a P-38 virtuoso as the result of his own experimenting and a series of aerobatic demonstration flights, says:

"After you've flown it a while, you can do aerobatics. But if you don't know your stuff a slow roll, for instance, at very high speed, will black you out. You just can't get funny with it until you know how to fly it. Then it's a cinch."

We find that the pilots do most of their speed runs over the ocean. The San Fernando Valley, with Burbank on its eastern end—the P-38 was flown from Lockheed Air Terminal—is about 20 miles long and about 10 miles wide. For the P-38 this isn't elbow room. When they reach for altitude, the valley doesn't matter. Three thousand foot mountains are just mole hills.

Yes, they're pioneering. And it's cold up there, but that doesn't matter. It's that thin air, that lack of pressure, which plays havoc with their bodies.

"We eat charcoal tablets to keep the gas out of our systems," Burcham says. "That high up, a bit of gas expands inside and it hurts."

But that's not all. Lockheed and the Mayo Clinic have been working on the effects of rapid ascent and descent on pilots. The report states:

"Our company, with Drs. Lovelace and Boothby and the Mayo Clinic, did considerable research and carried out numerous practical experiments on the effect of high altitude flying on the pilot. The word 'aerial embolism' may not mean a great deal in aviation nomenclature right now, but when man begins to really fly high it is going to mean a lot."

Parenthetically, while in future years pilots and passengers who fly through the stratosphere will experience no discomfort due to adequate heating system and supercharged cabins now being pioneered, there are today not more than 100 men in the world who have flown as high as these Lockheed pilots.

But, to continue with the quotes:

"The term, briefly, refers to a sickness caused by the release of nitrogen from the body. These nitrogen bubbles can become very serious if the pilot is not first decompressed. A method of decompression used by Lockheed during high altitude work is relatively simple. For a period of 30 minutes prior to a flight contemplated in any region above 25,000 feet, we exercise by riding a gymnasium type bicycle or walking a treadmill, at the same time breathing pure oxygen. This has been found to be a satisfactory method of coping with aerial embolism, and when properly done has practically eliminated sickness as far as the pilot is concerned, even when tests were carried out to simulate a rate of ascent of around 12,000 f.p.m.

"The next very important factor is 'anoxia', meaning a lack of oxygen. This is a very dangerous factor and must be treated as such at all times when high altitude flights are contemplated. The problem of an emergency parachute descent at any altitude above 25,000 feet would quite likely be fatal unless adequate understanding of the factors involved and thorough and proper preparation are taken before such a descent is contemplated.

"As an illustration, the rate of descent

(*Continued on page* 108)

All nitrogen is driven from pilot's body by riding stationary bicycle while breathing pure oxygen. This prevents forming of air bubbles in blood stream.

The author at the controls of a Lockheed "12," one of ships used for testing pilots.

Check Pilot

by Capt.
EDGAR J. WYNN

Pilots, like the planes they fly, have to be tested. Here's a check pilot's story of his experiences while judging flyers in Canada.

THE job of testing pilots for any type of advanced flying such as airline or military flying is a tough and complicated one.

I held such a job in the spring of last year when, as Flying Officer in the RCAF, I was assigned to Rockliffe Aerodrome at Ottawa to test all American pilots attempting to enter the RCAF, the Eagle Squadron of the RAF or service in the ATA in England. The latter is the Air Transport Auxiliary and consists of civilian pilots who ferry planes from point to point throughout the British Isles.

I was particularly fitted for this important duty because I was an American who could understand my fellow countrymen, the pilots whom I was to test; and because I held an "A" category as an instructor. I had spent the previous year teaching future instructors in the central flying school of the RCAF at Trenton, Ontario, on all types of air force planes and from practice landings in little *Tiger Moths* to advanced aerobatics in *Harvards* and night flying in twin-engined Lockheeds. I had also flown several types of English airplanes.

The plane used for the tests was a North American *Yale* known in the U.S. Army as a BT-14. It was ideal for the job because it was a low-wing monoplane like most of the ships the applicant would be required to fly. It had a controllable-pitch propeller, flaps and a fixed landing gear. It was found that the added duty of operating a retractable gear such as that on the *Yale's* big brother, the *Harvard*, was too much for the average civilian-trained pilot being tested. The pilots I was to test came from every corner of the United States, and included crop dusters, stunt pilots, airline pilots and pilots who had flown only lightplanes. Some were former Army and Navy pilots. The majority had never seen military service.

Each applicant had been flight-tested in the United States after his credentials had been tentatively approved. They were sent out to me from the RCAF headquarters in batches of six and seven a day for a final check flight. My decision was final from which there was to be no appeal.

It was a tremendous responsibility. I was fully aware that some of these men had burned their bridges behind them; had given up good jobs to which they could not return, on the hope of being able to pass this check flight and so do their part in whatever branch of the service they had elected to serve. Whether they wanted to go to the Eagle Squadron in England for fame, adventure or because they believed fervently in a good cause; or wanted to join the RCAF because their own Air Forces standards were perhaps a little too high, was not my concern.

My job was to obtain good pilots—men who could be useful to us—particularly without too much further training.

My first step was to obtain from each pilot a brief history of his flying experience. Some claimed 10,000 hours in the air, some 250. The majority admitted no instrument or night flying, almost none had multi-engined experience. Remember—in the case of those who were applying for entry into the ATA ferry service, I had to determine not only how well they could fly, but also if they could adapt themselves to jumping out of a *Spitfire* into a *Hudson* or huge *Wellington* bomber, and then in a few minutes, perhaps, back into a *Hurricane* to be ferried to some distant point.

One young hopeful stated his flying time as 740 hours, but admitted he held no pilot's license. I asked for his log book and it showed exactly 45 hours flying time. After much discussion, I managed to draw out of him the assertion that "he had the time but it was not logged." I asked him how he expected to be able to handle twin-engined equipment. He promptly claimed several hours in a Lockheed. Exerting every ounce of will power to keep from eliminating him on the spot with a fire extinguisher, I asked him where he had flown a Lockheed. Came back the quick, confident reply, "I was a mechanic for Blank Airline, and I rode along on all the test flights."

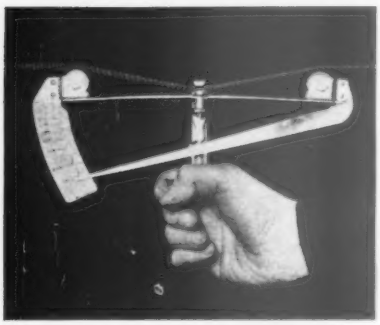
One young fellow from California, who claimed 400 hours, admitted to me, after failing his flight test, that he actually had 72 hours flying time in lightplanes.

My second step was to take the group out to the airplane for cockpit drill. The first man to be tested climbed into the front cockpit. The others placed themselves on the wing where they could see all that went on. Here again, it was necessary to bear in mind that this type airplane was strange to most of them. Carefully I explained the use of flaps, throttle, prop control, brakes and each instrument that they would have to use during the test. I deliberately told them to ignore cylinder temperatures, fuel pressure gauges and so forth, so as to make it as simple as possible. Questions were invited and patiently answered.

At this point, I produced a map of the area on which I had drawn a line to a point 20 miles away. On this line, I had written in ink the course to fly. I ex-

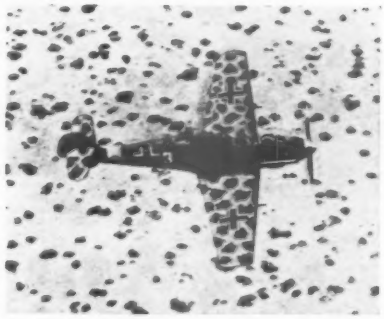
(*Continued on page* 84)

This Army Beechcraft F-2 is painted with big orange and green squares to make it visible against Alaskan snows.



This tensiometer made by the Geophysical Instrument Co. measures control cable tension.

HAVE YOU SEEN?



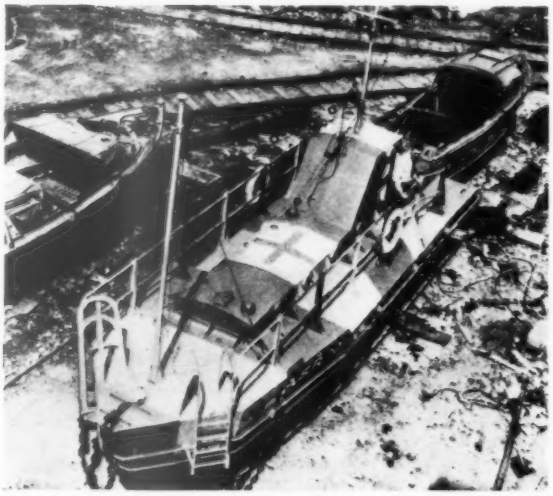
Messerschmitt over Libyan desert has clever pockmark camouflage on upper surfaces.

Australian pilots are using these Curtiss fighters effectively against the Axis flyers in Libya. British call them "Kittyhawks." U. S. designation is P-40D. The ships have increased horsepower and armament over previous models.

British women helped to assemble this North American "Mustang" fighter at secret English field where U. S. planes are received.

Experimental amphibian recently tested in Long Island. It has 75 h.p. Franklin engine, plywood hull and fabric-covered wings.

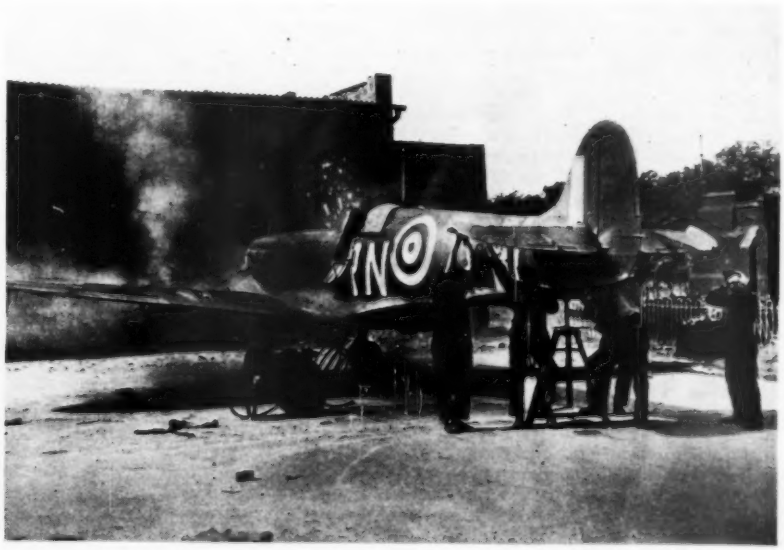
Private and CPTP flying in west coast states is only permitted 150 miles inland. To keep CPTP aircraft in the air, the letters "U. S." must be prominently displayed, as on this Waco training plane.



Britain operates a fleet of these rescue boats to pick up RAF flyers shot down in channel. Note Red Cross markings.

This is a four-engined bomber of the future conceived by Wright Field engineers. Note heavy armament, tractor and pusher props.

Controllable pitch propeller CAA approved for Lycoming 75 h.p. engine used on lightplanes.



Firepower tests with a British "Spitfire." The ship fires two 20 mm. rapid-fire cannon mounted in its wings. Wing mountings have increased cannons' rate of fire.

I LEARNED ABOUT FLYING FROM THAT!—NO. 33

by Capt. ERNEST GANN

Over-confidence on a 40-mile flight taught this veteran airline pilot a good lesson.

THE day it happened, I had 152 hours in my log book. With that amount of time I should have known better, but I didn't. I still didn't have my sky-thinking completely in line and I fell right into the same trap that has caught so many other pilots. In my vast confidence I forgot that you can get in just as much trouble on a short flight as you can on a long one.

I forgot the old rule that an airplane isn't landed until it's in the hangar under wraps—it doesn't make any difference if it's been up four minutes or four hours. I never ignored that basic air law again. The smallest mistake made around an airplane seems to have a way of multiplying into a great big snowball that winds up into a real jam.

Ever since I had soloed I had done more cross-country flying than average. I was pretty proud of my avigation and had made a number of two and three day flights out of little Christie airport near New York. On the day in question, I wasn't going very far—just a little 40-mile hop to an emergency field at Wurtsboro, N. Y. I owned an old Waco "A" at the time, equipped with a Jacobs engine. Not many of these were built. They were the usual Waco biplane design, but the fuselage held an open side-by-side cockpit. It was another attempt to get away from the tandem arrangement whereby the pilot had to yell at his passenger or student through a Gosport tube or simply into the prop blast. Although it made the ship very blind on the ground and somewhat so in the air, it was a good idea and is still in use.

The other peculiarity about the Waco "A" was the combination throttle-brake arrangement. Both were operated by the same handle located on either side of the cockpit. To operate the throttle, you simply moved the handle back and forth in the usual manner. To operate the brakes, you pulled *down* on the handle, kicking rudder at the same time. It was a rather tricky setup on first acquaintance—many pilots (including myself) got throttle when they wanted brake and vice versa. You had to be particularly careful not to pull the throttle in its outward arc of motion when landing or the brakes would take hold. The combined duties of this single-throttle handle made for a complicated joint affair attached to the fuselage. Its exact construction I cannot remember and it's unimportant—the lesson I learned from it is something else.

I arrived at the field late. That was my first mistake. Never arrive at the airport later than you originally intend—get there well ahead of time if you can. For some reason or other, the tendency is to make your take-off when you planned, regardless of how little time you've been at the field. A rushed take-off means hurrying things and in an airplane that's asking for trouble.

A friend was to meet me at Wurtsboro airport at 11 that morning. I hadn't seen him for a long time and I was anxious to show him that I was now a good enough pilot to arrive right on the dot. I hadn't yet learned that a dash of humility is a

Capt. Ernest Gann.

sure sign of a really experienced pilot. I grabbed a few maps, took a quick glance at them (after all, it was only 40 miles), then got the ship out of the hangar. There was a ragged overcast about 3,000 feet but that didn't bother me—remember?—it was only 40 miles. Such was my haste to make schedule that I didn't even bother to call Newark for a weather forecast. I kept telling myself it was only 30 minutes till I'd be gliding into Wurtsboro.

As I ran the engine up and tested the mags, I noticed the throttle was slipping back. The control seemed positive but it wouldn't hold in place. Ordinarily it held through friction and the tight ball joint. Everything else worked fine. It was such a little thing (I thought)—if I were starting on a long flight I'd wait and fix it, but 30 minutes . . . well, I'd just hold the darn thing. Nothing to it. Fix it when I got back. I had 152 hour confidence.

I took off and headed north. At 11 o'clock I was circling the field at Wurtsboro. I could see my friend standing on the ground waiting. I landed and we had a nice talk—too nice. I stayed for three hours. I told him that the throttle was slipping and we tried to fix it with the only tool available, a chipped screw driver from his car. It didn't worry me; it was just a nuisance to hang on to it. We thought we fixed it, but we didn't.

I shook hands with my friend, took off and headed back to Christie airport. I climbed to 2,000 feet and slipped along just beneath the overcast. There was a very light rain and some good dark muck ahead . . . but after all it was only 40 miles. I keep repeating that because I was thinking in terms of 40 miles. I hope you never do. Fat, dumb and happy, I charged right into as fine a thunderstorm as could be had.

Ten minutes out of Wurtsboro it really began to rain. I couldn't fly on instruments even if I'd had them so I let down to 1,500 feet. The hills weren't much below me. Still on the course, I flew into what seemed like a solid sheet of water. The turbulence was terrific. It was all I could do to keep the Waco right side up. I was continuously conked on the head with various sized hail stones—and that throttle! Every bump, every twist, would send it scooting back to me. The engine would settle immediately into a nice quiet idle. The Waco and I would respond with a rapid descent. What I urgently needed was a third hand. I had one on the stick, very busy, and the other on the throttle to hold it open. This left nothing to hold the map but my tightly-pressed knees which couldn't stay pressed and work the rudder against that turbulence.

I tried sitting on the map, which held it all right, but if I unfolded it enough for a good look it tried to get out of the cockpit. If you've flown open-cockpit ships in highly turbulent air you know what I'm talking about. I finally put the map between my chattering teeth and did some thinking. Obviously I couldn't keep this up for long. Even with a good throttle and a steady compass it would have been a job to stay on course. I decided I wanted to get out of that thunderstorm and made what I hoped was a 180° turn. That was about mistake No. 20.

The rain got worse, the air became rougher. I was drenched, blue with cold, and squirmed uncomfortably in a pool of water. I had long before pushed my goggles up because I couldn't see through them—yet with my bare face hanging out I couldn't see much over the side. The wet map was limp as a rag and kept slipping to the floor. Once it worked back under the seat. I did a hand-stand retrieving it. I took my hand from the throttle for a split second. When I raised my head again the Waco was diving for the treetops. Funny? I didn't think so at the time. I was dressed as an aviator and doing duty as a deep sea diver. I gasped for air and got a mouthful of water. I was literally drowning at 1,000 feet above sea level. With the air speed dropping to 40 m.p.h. every few seconds, the water just bucketed in the cockpit.

I called the throttle a number of un-

(*Continued on page* 113)

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PIPER POINTS THE WAY TO WINGS FOR ALL AMERICA

James R. Young . . .

(*Continued from page 23*)

2. Japan's whole air strength, consisting of 40 to 50 squadrons, is working far from home.

3. The Japs are using German bombs.

4. Many of their aircraft are antiquated. Observers from the British *Repulse* and *Prince of Wales* reported that the old fabric-covered planes burst into flames as soon as hit.

5. From examination of planes brought down, experts concur that the Japs are using inferior replicas of what were once second grade aircraft, designed four to six years ago.

6. In the speedier equipment younger American-educated Japs are being used. These are the "surprise boys" picked up in Pearl Harbor with Honolulu and Oregon State school ring insignia. Since most native-born Japs are lacking in long-range daring or experience American-born (and healthier) Japs were used.

The Japs cannot maintain early temporary victories. Neither can the Nazis. We have records now that Curtiss *Kittyhawk* fighters, in the hands of Australian pilots, brought down five Nazi Messerschmitt Me-109's and damaged seven others. Several of the Messerschmitts, being drilled by the Aussies with their new Curtiss equipment, deserted their bombers and retreated to home base. The Junkers were left to fare for themselves after unloading their bomb racks, to gain time for a quicker withdrawal from the firepower of the new and improved type of *Tomahawk*. The Nazis lost between 5,000 and 6,000 planes in Russia and Libya!

Every 24 hours our air strength is growing. Each turn of the clock weakens Japan's air position.

Anti-Japanese forces now operate from Australia, the Netherlands East Indies, China, Burma, the Philippines and Malaya.

As bases are implemented by long range encirclement of the A-B-C-D powers under a co-ordinated command, we will protect our rear alignment as we carry the war in the terms of an offensive rather than a defensive.

In every encounter so far reported, American and Dutch pilots have brought unprecedented defeat to the Japs. At Corregidor, Jap four-engined jobs and twin-engined ships, coming in alternating waves from their bases, suffered great losses—15 in two days to be exact, while heavy toll of the enemy was taken in a terrific artillery battle on the surface.

Nowhere in Japanese aviation records of a 10-year war, starting in Manchuria in 1931, have they had such opposition as is now arrayed against them.

Doggedly our youngsters, flying against seasoned Jap fighting men in both their services, are demonstrating that individuality, the ability to think alone, a superior machine—and eventually numerically favored—can and will blast the Japs out of the skies.

We know now the equipment the Japs are using: Hamilton-type propellers; Pratt & Whitney engine copies; auxiliary gasoline tanks which keep them in flight six hours and can be dropped in combat; two 20 mm. cannon; two machine guns; and specially developed 15-inch armor piercing bombs, weighing 1,500 pounds or more.

Japan staged sneak raids on Pearl Harbor and the Philippines. She won Hongkong because of a water shortage. But

when the Japanese turn toward home, they will have a return flight, coupled with a psychological effect, that will signal the Americans are in full action.

When the news of American action breaks from the Far East, it's going to be big news.

We know this of Japan:

1. Britons who were the last to leave Nagasaki, a port in western Japan, reported that their last departing impression was of symptoms of extreme nervousness felt by the Japanese about air raids. Air raid shelters in the cities are apparently totally inadequate in number. Wealthy classes had begun to evacuate their homes to the country. Small concrete tanks which hold but a few buckets of water had been built in the tinder-box cities to be used if water supplies are cut. In quantity they will be useless. Food is short and rice is strictly rationed, the British evacuees, who were long-time residents of Japan, reported.

2. The Japs know that when we hit, that will be the punch that will count. Every load we send them, from air or from the surface or undersea, will help ruin Japan. As Adm. Thomas C. Hart explained the situation: "Like a big game hunter with an elephant gun who sits hour after hour, day after day, waiting his prey. Sometimes it takes a long time to get results."

3. The Nippos are fighting the same type of warfare as of 40 years ago and using, in land campaigns, German shells and old Japanese rifles (.25 caliber) and swords. They are great tacticians in the air or on the ground—as long as the method which they memorized holds.

4. Japan fights according to five years of practice in China and according to the textbooks on strategy and tactics. Japan should have a good chance, but if a rival commander introduces something new, or, as American pilots have shown in the air already in a few weeks, by using individual initiative, no Jap commander can adjust himself nor rally his forces from the confusion into which they would be thrown. The Japs as fighting men have proved their fanaticism and courage in successive victories in China and in Malaya and the Philippines. But, their courage in a large defeat is yet to be shown. That they would attack Changsha by air and land three times in two years and still lose, is one of the fanaticisms of the Japanese military mind.

5. The Japs have demonstrated their fighting ability against more poorly-trained and slower-thinking people. They used fifth columnists and treachery to gain approaches to vital positions affecting the democracies in the Far East, but they are now against nations that can out-think them. This is especially true of the Dutch who know the Asiatics. Those who know the Japanese do not believe they could stand up in any vital test except in defense of their homeland.

The heroism of Capt. Colin P. Kelly, Jr., who, before his death sank the 29,000-ton Japanese battleship *Haruna;* and the 12 other Americans who have been awarded Distinguished Service Crosses, provides thrilling reading:

Lieut. Boyd Wagner of Johnstown, Pa., is credited with shooting down three Japs and destroying 17 planes on the ground. As Wagner rolled out of one dogfight into another be bagged a Nippo while flying upside down. Then he rolled over to clip another Nip, then dashed into another whole squadron of Jap flyers.

Knowing the Japs as I do, they think such feats occur only in motion pictures. They learn no such tactics from their rule books.

With inferior equipment, Lieut. Samuel H. Marett of Atlanta, Ga., flew into action at Vigan, 200 miles from Manila, set two Jap transports afire and strafed the invaders. In a third and final dive,

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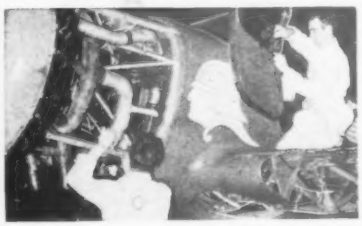

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while destroying another transport of yellow Aryans, he was caught in a wall of fire from the invaders and was killed.

The posthumous awards are a long and creditable recitation of what the Japs may expect when they come up against Americans on the alert, or already in action. Courageous leadership and quick thinking is an encouragement to everyone on the front line.

The Burma Road gang's exact strength and the amount of equipment remain a secret. I anticipate they will be the American *Commandos* who, from secret bases in China, will invade Japan probably before aircraft carriers approach the shores of Nippon.

Now that we know the nature of the attacking force, I do not believe the Japanese can maintain renewed air attacks without suffering losses so great as to cause them to stop sporadic attacks all over the map.

Americans in the Philippines have reported that "while the suddenness of the Japanese assault has given the raiders an initial advantage, the Japanese got the worst of it in individual aerial dogfights . . . we certainly do not think they are supermen."

The Japs have found that even the Filipinos can fly. They are learning that the Dutch do not argue and that they know how to use Axis methods of fighting and do not mind the nature of the odds—especially if the enemy is from Japan. Dutch flyers are more than a match for any Japanese. The Dutch believe in working around the clock, stabbing and socking blows at the invader twice as fast as the Japanese can evolve their plans.

The Japanese took Point Victoria, a strategic RAF base which was an outpost of Singapore's protection. They seized Penang, the only direct air route between Malaya and India—a situation which not only has imperiled Singapore, but the capture of those two very important points—which should not have occurred —put the invader 180 miles from Dutch Sumatra. In addition, Japan captured 15 British airdromes in Malaya in one month.

"Little Holland" in the East Indies is doing a magnificent job. She would have done better had the Dutch been able to buy more equipment from the United States, as was stressed in Maj. Gen. Van Oven's article in the December issue of FLYING.

The Dutch air force may have as many as 1,000 planes. Most are of American origin—Glenn Martin bombers with 1,800-mile range; Curtiss *Falcons* for reconnaissance; Curtiss CW-21 interceptors, Curtiss *Hawks* (P-36) pursuits; Consolidated *Catalina* flying boats for bombing and reconnaissance, Douglas bombers, Brewster *Buffalo* pursuits, Ryan land and seaplane trainers and Lockheed *Lodestar* transports. Their squadrons are scattered over a large number of bases.

The flying Dutchmen did a masterful job in bringing from Holland—around the Cape of Good Hope through 12,000 miles of treacherous sailing conditions—the entire submarine fleet of their navy. They are doing as well in the air.

The Dutch navy in the Pacific is small, but it is fast. It comprises an estimated handful of cruisers, two hands of destroyers, 40 torpedo boats and two score subs, powerful bombers, long-range naval patrol planes and perhaps 500 fighters.

When the Dutch proclaimed martial law they immediately decreed all-out mobilization. They do not argue. They act, then discuss. As pilots and navigators they are the best in the Far East.

The Netherlands archipelago is 3,000 miles long. The Dutch recognize the difficult task of keeping Jap subs and small boats from hiding along their coasts. The shrewd and capable leaders of the East Indies never once trusted Jap diplomats, newspaper correspondents, fishermen or traders. As soon as war broke, Japanese were interned; Jap settlements in Borneo were raided; motor launches were seized and promptly broke any sign of resistance or sabotage.

The Dutch have been on the alert since May, 1940. They were geared to meet any situation. Hidden aviation gas and oil, and 50 secret landing fields dot the five main islands. In the air or undersea, Dutch navigators can match anyone. In the air they are superior in speed and accuracy to anything the Japs have ever observed.

The Japanese know that, next to Singapore, their toughest job is to crack the East Indies. Yet, with a half billion dollars in cash available, the Dutch pled for months for more planes from the United States. Most of our equipment, they complained, was going to Russia and England. They had pilots. They wanted bombers—and more bombers. Fighters, as General Van Oyen will tell you, are useful for local defense. But to patrol a jagged, irregular coastline of hundreds of isles equal to the distance between New York and San Francisco, long distance bombers are badly needed.

I admire the Dutch for preparing for what they believed—rightly—would be an attack from Japan. Java has become, in many months of careful planning, a fortification of its own. The natives joined with the Dutch in preparing for the Japs. And the white men of the N. E. I. will be the last to declare Batavia, Bandoeng and Sourabaya open cities. They did not argue over building defenses or, through lack of equipment, invite an invader's attack. They were not caught in the position of "open" Manila, with its high advisor who withheld—by a legal technicality—the transfer of funds which could have made the Philippines fast against air raids.

The Dutch bought ahead, all they could purchase, for defense purposes.

The natives of the Netherlands East Indies and Philippines are fighting a foe superior in numbers and equipment, but they have a common understanding in repulsing the arrogant, vicious and brutal yellow invader. The Dutch natives are in a preferred defensive position: their wise leaders prepared for war in time of peace. They will hold to the last.

If the Battle of the Pacific is to mark the turn of a threatening offensive by overwhelming Japanese force, it must be

(*Continued on page 71*)

Stinson Voyager

CREATING PILOTS FOR NATIONAL DEFENSE.

No part of the Defense program is more important than the training of pilots in cross-country work. No other plane is more competent than a Stinson for this vital job.

STINSON PLANES for years have led all others in the vital requirement of cross-country and navigation training so necessary for creating Instructors for our Army and Navy. An overwhelming majority of experienced operators charged with the training of pilots for blind or instrument flying place their faith in Stinsons. Stinsons are the choice now for Civilian Pilot Training just as they have been for years by the Nation's leading airlines in training pilots in blind or instrument flying.

Stinsons are built to go places year in and year out. Their unequalled safety record which protects the Operator's investment and the student's safety is a result of design which embraces modern airline and military features. Included are slots, flaps, electric starter and generator, splendid vision, steerable tailwheel, wide landing gear, and hydraulic shock absorbers.

As for economy, the Stinson "Voyager" costs less to operate than an automobile—only 1⅓ cents per mile for fuel and oil.

Because they are comfortable, quiet and provide an easy ride, more instruction can be given daily without undue fatigue.

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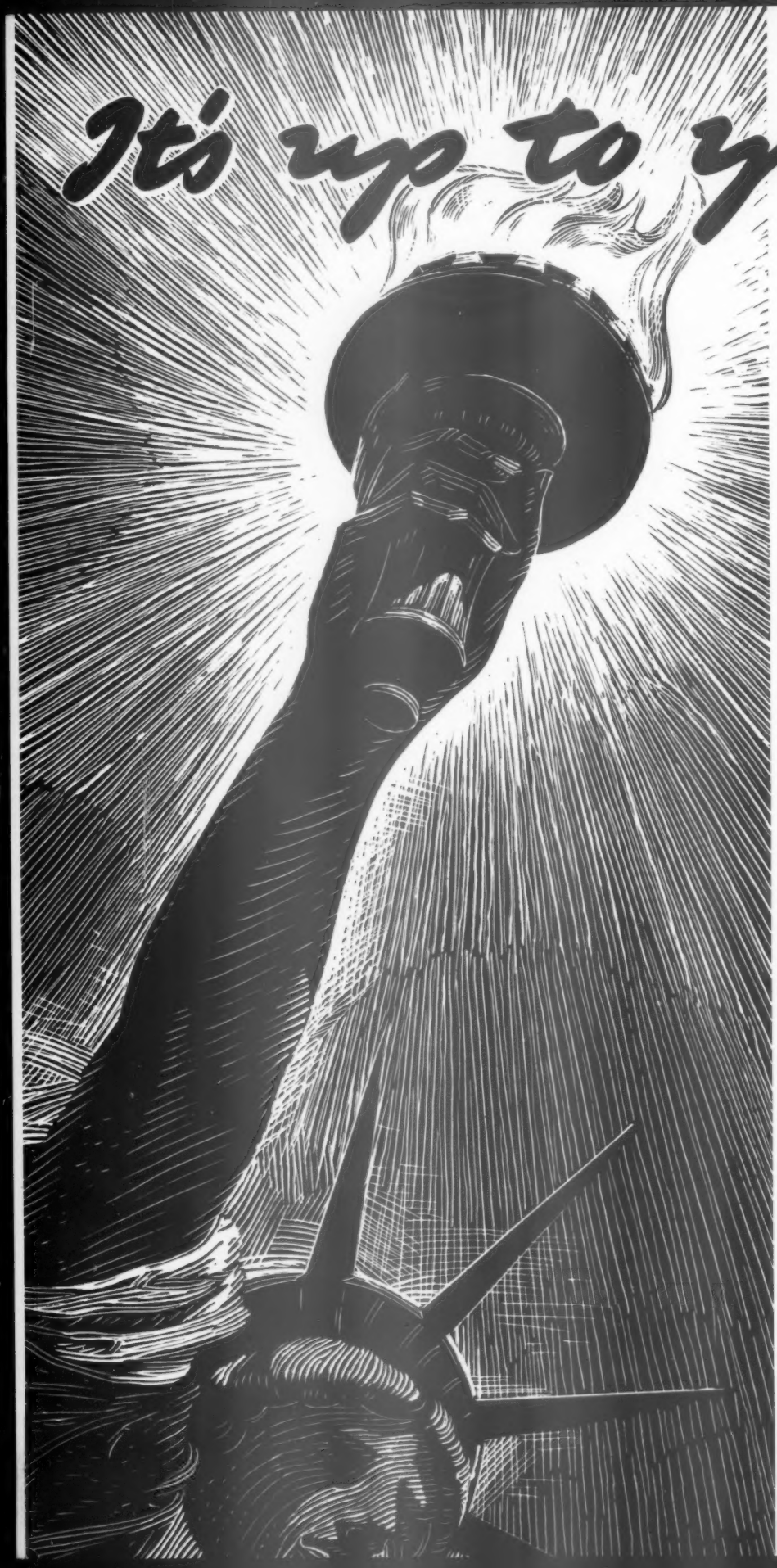


THE torch of liberty is still held high and burns fiercely over America. Gift of a people prostrated by the aggressor, our Statue of Liberty now, more than ever, stands forth as a beacon of hope in a world of fear. To each and every one of us is given the privilege and the duty of keeping freedom's light aflame.

On land, sea and in the air, American guardians of liberty and fighters for freedom everywhere are joined in the common cause. We of Douglas, 40,000 strong, are doing our share in providing the tools to finish the job. In forges, foundries and shops throughout the nation other Americans are doing their share.

But men and women behind machines and men behind the guns of ships, tanks and airplanes cannot complete the task alone. They need your help, support and confidence; so do your servants of government. America's aircraft industry has tackled history's biggest job. It can be done; it will be done. It's up to you how soon and how well we succeed.

Donald W. Douglas

PRESIDENT, DOUGLAS AIRCRAFT CO.

WHO WILL BE THE KEY MEN OF TOMORROW IN AVIATION?

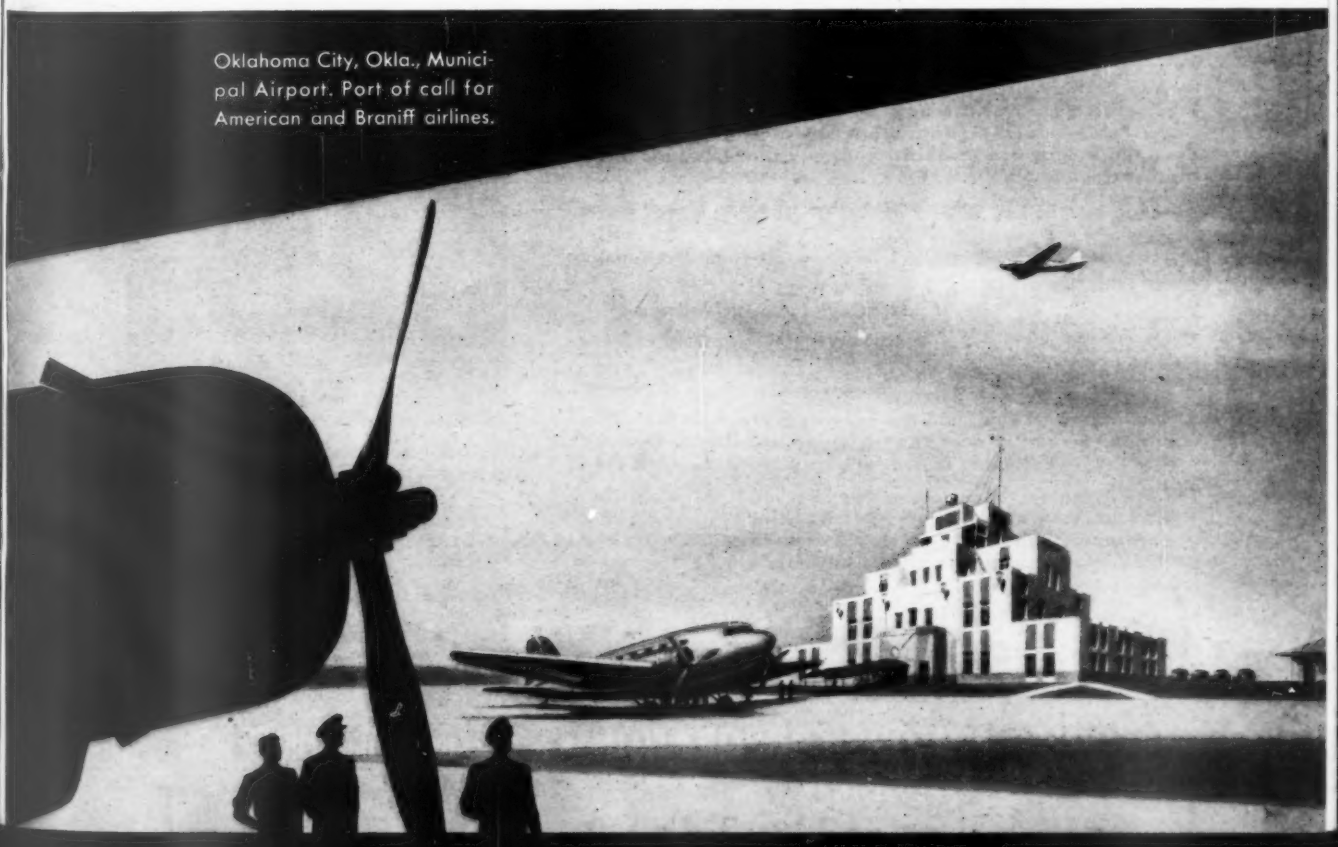
THE FIRST few weeks of war made clear to all the fact that America's future lies in aviation. Planes and more planes are the need of the hour. The United States, most fortunately, can and soon will overcome all its enemies in the production of fighting aircraft. ¶ That fatal months and years do not separate us from this goal is largely due to the vision and perseverance of a small but hardy group of pioneer aircraftsmen. They stayed in aviation through thick and thin—despite public apathy and many hardships. And the day has come when their experience, their inventive and manufacturing skills are priceless and formidable weapons in the service of our country. ¶ America's persevering aircraftsmen have set an example for the generation which is taking over. And there is no doubt that our young men in aviation today will profit by and honor this example. Thousands are prepared, thousands more are preparing—thoroughly and resolutely—to make American aviation the most powerful force in the world for victory—and later peace.

The Future of Aviation

You who begin your aviation career today with the primary thought of serving your country will also build for the future. For peace will surely bring an unprecedented development of commercial flying, especially in this hemisphere. The men who are best equipped to serve—in war and peace—will be the key men of tomorrow in aviation. Our schools' single purpose is to train such men.

C. S. Jones
President

ACADEMY OF AERONAUTICS, *LaGuardia Field, New York*
CASEY JONES SCHOOL OF AERONAUTICS, *Newark, N. J.*
Complete technical courses in aeronautics



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Follow Franklin

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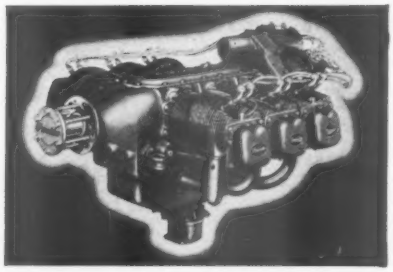
FIRST to power a twin-engined light plane, two Franklin 65's drive the new plastic-plywood Langley.



FIRST six cylinder aircooled aircraft engine of the horizontally-opposed type to achieve quantity production.

★ When in 1938 Aircooled Motors Corporation acquired from the Franklin Automobile Company its name, its patents and its designs, it inherited a tradition of fine workmanship and a vast fund of air-cooled engineering experience and technical knowledge—38 years of it.

★ Add to these the ever-active Aircooled spark of inquiring creative genius, the never-ending search for a more dependable, more economical series of engines and you have the reason for Franklin greatness that has pioneered these achievements:

★ *The first horizontally-opposed six cylinder air-cooled aircraft engine in production.*

★ *The first light plane engine in production equipped with electric starter and generator.*

★ *The first successful engine to power the first successful helicopter.*

★ *The first engine to power a twin-motored light plane—the new plastic-plywood Langley.*

★ *The first aircraft engine to approach automotive silence of operation.*

★ Right now, as you read this message, Franklin firsts that will make a revolutionary contribution to military aviation are being developed, tested and produced at Aircooled Motors.

★ And looking beyond the war, Franklin men even now are training their sights on more pioneering firsts for the greater safety and progress of civil aviation.

Franklin

★ AIRCOOLED MOTORS CORPORATION ★

SYRACUSE, N. Y.

CLARK serves the Nation on the flying fields of War and –

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– in the arsenals of Production and –

on the airways of Peace

CLARK TRUCTRACTOR Division of
Clark Equipment Company, Battle Creek, Michigan

Manufacturers of Industrial Trucks and Tractors

James R. Young . . .

(*Continued from page 62*)

done with air power. Japan has not shown unexpected or exceptional military skill in her Philippines stabs, but she is using an estimated 100,000 men, aided by countless barges, aircraft carriers and all types of navy vessels against a numerically inferior group of valiant American and Filipino defenders.

In the few details received of American air action in the Far East, it is evident that our men have displayed a superiority in handling their equipment and in outflying the enemy, although the Japs have had a vastly greater number of planes in the air. But in sustained long range attacks the Japanese will lose in shipping and in the air. We can cut her reinforcements, annihilate their expeditionary force, keep their fleet scattered throughout the Pacific and push them into a defensive position. As all who know the Orient will agree, we must bomb Formosa thoroughly. Thailand must be bombed day and night. The 200 American pilots on the Burma Road must carry their attacks to Japanese-occupied Hankow and Nanking. Russia must commence the bombing of Tokio, Osaka and western Japan. Without hesitancy, we must sweep the Pacific, from the Jap subs on our west coast to Japanese minelayers in their home waters. Alaska must send our bombing planes to Japan.

The Japanese can maintain an offensive, as did the Nazis in Russia, only while over-extended transportation lines remain unattacked. Once these are intercepted and their reinforcements are unable to replace destroyed units, the Japs will find themselves drowning in the Pacific just as they have, after five years in China, bogged in the mire of their own making.

America's seven-day-a-week production lines surpass anything ever dreamt of in Japan. Sixty-seven U. S. cities and towns in nearly two-score states are producing engines, tanks, trucks, machine guns, aircraft cannon, high speed torpedo boat and submarine engines in such quantities as are unknown in Japan.

Tokio's leaders obviously have underestimated America's strength in material production and manpower. We must demonstrate to them, by more than blow-for-blow reaction, our superiority in the air.

While immediate major fleet action seems unlikely, I am confident, from what I have seen of the U. S. Navy in the Pacific, that we can handle any Japanese force, over any distance. Against us, the Japanese do not have the plant capacity, the organization or the materials to maintain a long conflict. Her ambitions outdistance her productive capacity.

Japan can be made a menace to herself. She had already failed in China when she rallied everything for a final—and fatal—blow, to her own supremacy in the western Pacific. To have attacked the United States is an admission by Japan of defeatism brought on through desperation.

Japan has suffered progressively in her long war with China—which will be accentuated in her war on the democracies—through agricultural deterioration, lower standards of living, industrial disintegration, financial exhaustion and, so long as the war continues, Japan's position in these four categories will decrease proportionately—and, I emphasize, rapidly—all to our advantage.

I question the assertion that Nazi flyers are serving in the Japanese air force. I do know, however, that Nazi pilots and assembly crews have been working *inside* Japan. Germans have been training Jap parachute troops, the first of which were used in China in the autumn of 1941 and again in the Philippines, Malaya and the Dutch East Indies in December and January.

The Japs are using, we have learned, adaptations of American Lockheed "14's", Martins, Douglases, Italian types, Junkers, Heinkel He-112's, Dornier flying boats (which they acquired three years ago) and North American NA-16's and Seversky's.

In the United States for 1942 we have ever-increasing appropriations allotted for additional planes in all categories. The total expenditure will give the United States the world's greatest air power.

We will eventually be turning out one plane every four minutes.

U. S. production of 100 octane gas for aircraft has increased to 45,000 barrels daily. Before the end of the first six months in 1942, production will reach 120,000 barrels daily. The Japs cannot manufacture better than 80 octane fuel and their production is limited.

Machine tools, so important in aircraft building, reached an all-time record in the United States with the production of 200,000 units—which is 100 per cent more than for 1940 and eight times normal yearly production over the past 10 years. Our machine tools are three times more efficient than those of a year ago.

The Japanese, I remind my readers, would almost have dropped the war if they had had such figures available. But fanatics cannot face facts.

Employment in American aircraft industry is 390,000. Weekly payrolls are nearly $15,000,000. Japan's total employment in aircraft production is about 10,000, including thousands of women and inexperienced children who have been pressed into factories due to the acute labor shortage.

American and Canadian aluminum production will reach a volume of a billion pounds for 1942. Japan must import her aluminum supplies, and always as in the past, in limited quantities.

"If steel is the foundation of modern war, it would be rather dangerous for a power like Japan, whose steel production is only about 7,000,000 tons a year, to provoke quite gratuitously a struggle with the United State whose steel production is now about 90,000,000 tons a year," Winston Churchill remarked recently.

"It would seem a hazardous venture for the Japanese people to plunge quite needlessly into a world struggle in which they find themselves opposed in the Pacific by states whose population comprise

"Yessir, I'm IN A CLASS BY MYSELF!"

"Yessir, that's true! Ever since I enrolled for special training in Airplane Drafting with the International Correspondence Schools, I've been 'in a class by myself.' Because every I.C.S. student is really a one-man class. His classroom is in his own home, and there aren't any slow-pokes or dunces to hold him back! He gets *personal, individual instruction!*

"Maybe that's why it takes only a few months for many I. C. S. students to get specialized training that 'pays out' in promotion or a fatter pay envelope. As a matter of fact, a few weeks after I began studying, my boss noticed the improvement in my work — and, since then, I've been given a more responsible job.

"Right now, of course, there's a terrific shortage of trained men in the aviation industry — and if you're as smart as I think you are, you'll mark this coupon and mail it. And I don't mean tomorrow!"

LET'S GO! U.S.A. KEEP 'EM FLYING!

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☐ Electrical Drafting
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☐ Electric Lighting
☐ Foundryman ☐ Heating
☐ Heat Treatment of Metals
☐ Highway Engineering
☐ House Planning ☐ Machinist
☐ Industrial Metallurgy
☐ Locomotive Engineer
☐ Managing Men at Work
☐ Marine Engines
☐ Mechanical Drafting
☐ Mechanical Engineering
☐ Navigation
☐ Patternmaking ☐ Plumbing
☐ Practical Telephony
☐ Public Works Engineering
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☐ R. R. Engineering
☐ R. R. Section Foreman
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☐ Reading Blueprints
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☐ Sheet Metal Work
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FLEETWINGS' new basic trainer, BT-12, now being produced in quantity for the U. S. Army Air Forces, is the world's *first* military airplane built principally of stainless steel . . . and it's 100% welded! This new ship will be "air-ancestor" to many bigger and faster planes yet unborn.

It's natural that Fleetwings should design and build the BT-12 for their engineers have long pioneered in developing spot-welding equipment to speed production of stainless steel aircraft and parts . . . so that Fleetwings has become the world's largest manufacturer of stainless steel planes and structural aircraft parts. In using stainless steel so extensively, Fleetwings relieves, in part, the shortage of other materials for aircraft.

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pioneers with parts and hydraulic equipment

Roster of military airplane manufacturers who obtain fleeter wing-surfaces and other parts from Fleetwings reads like Uncle Sam's "All-American of the Air"—Brewster, Douglas, Martin, Republic, Vega, Vought-Sikorsky, Vultee.

To speed production of fins, elevators, stabilizers and rudders . . . for planes ranging in size from small trainers to giant Flying Fortresses . . . Fleetwings has pioneered with ten new efficient final-assembly lines. A jig rolls down each line, and each worker on the line does only one or two simple operations instead of several. Output of aircraft parts has been more than tripled by this Fleetwings innovation!

Recently Fleetwings has put into operation a number of electric arc-welding machines to complement the many spot-welding and seam-welding machines pioneered by Fleetwings engineers. As a result, Fleetwings is able to build aerodynamically superior planes and structural parts, lighter because they're rivetless . . . with more than 25% faster production, fewer man hours per plane or part, and substantially lower assembly costs.

Hydraulic valves, specially designed for operating retractable landing gear, wing flaps, machine gun banks and other devices, have been a major development in the large line of Fleetwings' hydraulic equipment. For instance, Fleetwings recently designed a new hydraulic gun-charging valve that charges ten machine guns, individually or simultaneously, faster and more efficiently than previous devices . . . yet reduces by 60% the amount of tubing, connections and fittings ordinarily required.

"KEEP 'EM FLYING"

FLEETWINGS

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nearly three quarters of the human race," Churchill said.

"The guilty men who have let hell loose upon the world are hoping to escape with their fleeting triumph and ill-gotten plunder from the closing net of doom."

Within one week of the Philippines' attack, the Japs lost 26 planes in a single engagement. Their attacks that day were rather amateurish. Previous accuracy of their bombing might be attributed to experts taking the lead, as in German tactics, to be followed by younger and more recently trained men. Hundreds of bombs were dropped in Manila bay, but the percentage of hits was small.

An American colonel in Luzon described the Japs as being third- or even fourth-rate fighters. For seven hours our men engaged the invaders as the Japs made a wonderful display but mostly lots of noise and a tremendous waste of ammunition.

(*Continued on page 74*)

The CAP

(*Continued from page 52*)

agency utilizes an individual or a unit of the CAP for a mission, it is expected that the employing agency will provide remuneration for the pilots and equipment so used. The CAP has revised its regulations so as to permit private pilots to accept remuneration from Federal agencies for flying on a defense project approved by the CAP commanding officer. Such remuneration is ordinarily forbidden the holder of a private license.

Special CAP uniforms have been designed but, although some form of identifying emblem will undoubtedly be provided all aircraft, personnel and ground motive equipment in CAP activities, the flight plan procedure will continue as the only official check on authorized flights. It is made plain that flight restrictions are based upon such vital military necessities that their violation is exceedingly serious.

The flight plan is the fundamental method of identifying aircraft as friendly or enemy, whereas insignia could easily be copied by the enemy. No aircraft should be aloft in the United States, the flight, character and identity of which is not known to the combat commander of the Air Forces. Any airplane that flies *must* file a flight plan.

Each flight plan is filed, goes through the great network of communications of the CAA and thence to the combat commander, through whom it reaches the filter office in an information center. At this office all reports of aircraft in flight are received. If no flight plan is filed covering a civil, Naval or Army aircraft in that particular sector where a plane is reported in flight then a "red tag" goes up designating that plane as an enemy aircraft and an interception is promptly worked out.

It is understood that the rolls of the CAP will be carefully combed for men and women qualified for responsible duties directly under Army, Naval or other Federal agencies charged with the actual prosecution of the war effort. For example, the Army probably will employ many experienced civilian pilots for utility work, especially in ferrying of military aircraft, and thus relieve Army pilots for combat service.

Offices of the nine CAP regional commanders are:

First Region (Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island): 101 Milk Street, Boston, Mass.

Second Region (New York, New Jersey, Delaware): 111 Eighth Avenue, New York City.

Third Region (Pennsylvania, Maryland, Virginia, District of Columbia): 400 Cathedral Street, Baltimore, Md.

Fourth Region (North Carolina, South Carolina, Tennessee, Georgia, Florida, Alabama, Mississippi, Louisiana): Hurt Building, Atlanta, Ga.

Fifth Region (Indiana, Ohio, Kentucky, West Virginia): 427 Cleveland Avenue, Columbus, O.

Sixth Region (Wisconsin, Michigan, Illinois): 120 S. La Salle Street, Chicago.

Seventh Region (North Dakota, South Dakota, Minnesota, Iowa, Missouri, Kansas, Arkansas, Nebraska, Wyoming): 620 World Herald Building, Omaha, Neb.

Eighth Region (Texas, Oklahoma, New Mexico, Colorado, Arizona): Majestic Building, San Antonio, Tex.

Ninth Region (California, Nevada, Utah, Idaho, Montana, Washington, Oregon): 232 Sansome Street, San Francisco.

END

We'll Do the Job!

(*Continued from page 26*)

semblies for the North American B-25 and the Martin B-26 plants in the midwest. Automobile manufacturers' facilities have been thrown into production of Pratt & Whitney and Wright engines, as well as the British Rolls-Royce and our General Motors' own Allison engine. The pooling program, among the automobile, aircraft and other industries, undoubtedly will be extended to meet the call for 185,000 airplanes.

The plans of the Army, Navy and the aircraft industry to meet the needs of the emergency have been in existence with changes at intervals for more than 15 years. Each of the intervening years has brought experience and adjustments. The last two and one-half years—the years of "all-out" preparedness—have produced not only the best airplanes and capacity for more planes, but also invaluable lessons, the full value of which will be seen in future military and commercial machines.

Plans will change to meet variable situations, but the accomplishment of the aircraft industry in tripling its production during 1941, and at the same time building vast new plants for still greater production, justified the confidence that the aircraft industry and its legions of subcontractors—including the motor car people—will be able to meet all the requirements of this war.

END

"They're no damned good on the ground" the colonel told reporters in a tone of contempt.

Our boys in the air will find this is true of Japanese flyers.

Here is an interesting summary of Jap planes brought down in several recent engagements:

They are using old stationary landing gear. Engines are low-powered. Everything is copied, but not as good as the original. This bears out my previous statement that they have "everything from everywhere."

Honolulu confirms previous assertions that Japanese are good bombers when they are not disturbed, but under fire they get rattled and provide targets "as easy as ducks in shooting galleries." In the opening attack at Pearl Harbor 41 of them were downed.

Japan long has been known for double dealing, treachery and ignoring international codes. She used gas attacks on Changsha. Jap pilots haven't any qualms about shooting a pilot who has been forced to bail out. Lieut. Walter Cross of Pennsylvania learned this when he tangled with two Jap planes and came out on the short end of the deal. When his parachute landed him in a river, the Japs proceeded to machine gun him. Only rotten aim saved Cross.

In their first baptism of fire, the young Americans made a fine impression on the war correspondents, including O. D. Gallagher, a fellow International News Service reporter who cabled from Rangoon, Burma:

"THIS WAS THE FIRST TIME I HAD SEEN AMERICANS AT WAR. BOY! THEY'RE THE TOP OF THEIR CLASS."

But, he added, "it is my unpleasant duty again to report superb flying by the enemy."

However, Gallagher, who is a veteran from the sinking of the *Repulse*, added:

"BE THAT AS IT MAY, THE ANGLO-AMERICAN AIR COOPERATION MUST HAVE BEEN AS PERFECT AS ANYTHING HUMAN CAN BE BECAUSE ALTHOUGH FIGHTING AGAINST SUPERIOR NUMBERS THE BRITISH AND AMERICANS SHOT DOWN CONSIDERABLY MORE AIRCRAFT THAN THEY LOST THEMSELVES."

One American in that engagement said his parachute, after the Japs had fired on him when he tumbled out, looked like a watering can spout.

Many Jap pilots, it was found, are from high classes of society. They were educated or trained abroad and, on returing home, found business was bad for them so they entered the navy, which was about their only outlet. Most of them speak English or German.

Germany meanwhile, with her reverses in Russia and Libya, cannot lay claims to being ahead of the United States. Great changes have been effected since December 6, when the Russians started the Germans homeward. The Nazis may have more pilots than the United States, but they do not have the ability to sustain a pilot training program as intense as the Americans, nor do they have the facilities for production of planes.

Japan is given credit for producing about 1,000 pilots a year, but most are of inferior quality and, if Americans are not natural born flyers, then the Japs are ground hogs.

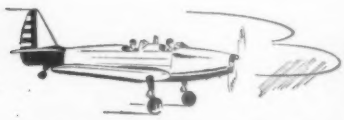
America knows that the air arm of the Army and Navy will win the war and we have set ourselves to the mastery of the world in the air. The extent to which our airplanes will be a deciding factor in determining the outcome will be in direct proportion to the number which our industry is able to produce, according to Col. John H. Jouett, president of the Aeronautical Chamber of Commerce of America [also see page 24—Ed.].

The American air pilot program, and the expansion of the aviation industry in this country, has no counterpart in the world. It is superior to anything any enemy possesses and, while full details cannot be revealed, I know, as one who knows Japan, that all the Japs cannot match one lone American factory.

END

A Wordy Business

BY a conservative estimate, 35,250 words are spoken over Braniff Airways' radio network daily. "And that doesn't include about 50,000 transmitted daily in code," reports A. G. Charles, the system's chief radio operator.



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Model of this Ranger-Powered Fairchild courtesy of Fairchild Aircraft.

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How the Greatest Name in Rubber *became a* Great Name in Aviation

TODAY Goodyear is one of the nation's foremost builders of light metal-alloy subassemblies and parts for the mighty new air fleets that will win victory for America.

How Goodyear comes to be building them is a story of unswerving faith in the future of aerial transportation that goes back to the dawn of aviation.

It begins with our development of the first practical airplane tire in 1909. Then airplanes were still using primitive undergear – sled-runner skids, or bicycle tires that often burst and ripped off under landing impacts.

The new Goodyear "Aeroplane" tire made take-offs and landings so much easier and safer, many airplanes were using it by 1910.

Next we learned that aviators were complaining about wing coverings. The varnished canvas then used stretched and flapped in flight, retarding speed.

Our solution was the development of a stretchless rubberized fabric, so tight-fitting it added 5% to an airplane's speed. At the 1911 Chicago Aero Meet nine out of ten planes had Goodyear-covered wings.

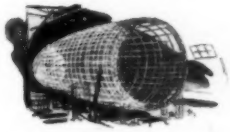
This success led us to build a giant 80,000 cubic foot racing balloon of similar fabric – the famous Goodyear 1. In 1913 it won the Paris International Balloon Race and brought the James Gordon Bennett Cup back to the United States.

So when the World War came, both the Army and Navy turned to us for lighter-than-air patrol and observation craft. More than 40 non-rigid airships or "blimps," and upwards of 800 "sausage" balloons were delivered to the U. S. forces.

Shortly after the armistice Goodyear completed development of the first rubber-covered, bullet-puncture-sealing gasoline tank for airplanes.

During this period airplanes were becoming larger, faster and heavier. Smooth, safe landings became difficult on hard, high-pressure tires. Goodyear met this with the low-pressure type Airwheel that has since revolutionized all tire design.

In 1928, when the Navy decided to build two giant rigid airships, they naturally turned to Goodyear as the nation's most experienced builder of airships. In constructing these great ships – *the largest aircraft ever built in America* – we faced the problem of obtaining stronger duralumin alloys than this country had ever produced.

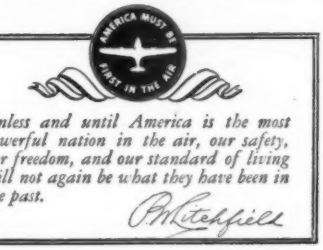


As a result of Goodyear's efforts to secure stronger, lighter alloys for airship fabrication, America today produces alloys for airplanes far superior to any known twenty years ago.

During the thirties we developed featherweight magnesium-alloy wheels for transport airplanes, and hydraulic disc brakes that pack tremendous stopping power in small compass.

Today Goodyear's great aircraft parts factories are producing complete all-metal wing and tail assemblies, nacelles, floats, ailerons, cabin structures, bullet-puncture-sealing gasoline tanks, wheels and brakes – in ever-growing torrent.

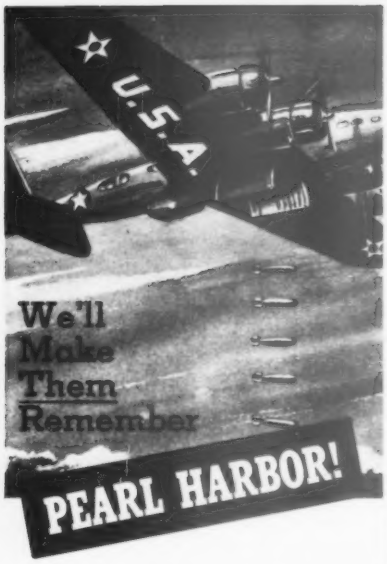
Upon this work we are devoting all the aeronautical experience and skill acquired in thirty years of pioneering, in full realization that our liberty is not secure until America commands the air.



Unless and until America is the most powerful nation in the air, our safety, our freedom, and our standard of living will not again be what they have been in the past.

P. W. Litchfield

GOODYEAR AIRCRAFT



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If You're Going to England

by
Maj. Charles Kerwood

Originally written for the information of U. S. Army Air Forces officers assigned to duty in England, the report which follows gives such a fresh, unembellished insight into what an American might expect to find in Britain that we requested War Department permission to reprint the entire text intact. Major Kerwood, a veteran Army aviation officer who also served in the first World War, wrote this after visiting England himself recently. He addressed it to his fellow officers, entitled "So You Are Going to Serve with the British Forces."—Ed.

THE following observations and recommendations are those of one who has spent years of residence in foreign countries and, while constantly changing economic conditions are bound to cause readjustments, it is felt that the following will be of considerable assistance.

Your assignment for duty or service in England with the British forces is considered a highly technical one, and in this capacity you will have access to considerable information of a secret or confidential nature. Upon your arrival in England you will undoubtedly see many posters stressing the need for caution at all times in your conversation. One poster which is captioned "KEEP MUM. SHE'S NOT SO DUMB", itself emphasizes the necessity and importance of avoiding at all times the discussion of confidential and secret matters in private as well as public places.

The contrast in every-day living conditions to which you have been accustomed in America will strike you forcibly. The explanation is very simple. The British are on a strictly war basis and care only for the essentials enabling them to pursue the war, whereas here in America you have been in a position to regard as necessities or as every-day common-place articles which to the British are either luxuries or more probably unobtainables.

You will find reports that England is starving are untrue. However, one should be prepared for the possibility of obtaining, due to the limited supply, one egg a week. Butter is to be had on the same basis. Oranges—few that there are—are saved for the sick and needy; hence, orange juice is a rare treat.

Then, too, you will find a great stress placed upon the salvage of all waste products. Cordage of all kinds, metals, scrap, used tins, waste paper and cartons are considered of the highest value for the purpose of collection and break-down for re-use. The British people will look at you askance if you are seen throwing paper or such things as lead foil away.

You are to be cautioned at all times against offending British sensibilities or making snap judgments of the attitude or activities (or lack of them) of officers and men who have been at war for over two years and who, in any case, may represent a small minority of the British armed forces. Especially emphasized is the necessity for tolerance for the many differences in viewpoint, customs and technique between men and women raised in different countries. You, coming from a wealthy nation, will find it most difficult to make allowances for the stresses and strains of those peoples who have for the past two years been living a life under the most trying conditions.

CREDENTIALS. Passports are necessary even when traveling to and from England via the Air Corps Ferrying Command. The passport should be supplemented by "Officer's Identification" (W. D.—AGO Form 65-1).

Passport photographs should be not less than 2½" by 2½", or more than 3" by 3", and should be on a light background so that the signature across the face of the photograph, in keeping with the State Department requirement, will be legible. At least one dozen of these passport photographs should be carried for the purpose of special passes.

The Adjutant General's Office handles passport arrangements for all officers other than G-2 and Air Corps. The G-2 M/A Section handles passport arrangements for all officers with G-2 orders, while passports for Air Forces officers other than those with G-2 orders are taken care of by Air Intelligence. Officers being assigned to duty in England should report to the sections as outlined with their passport photographs at the earliest possible date so that necessary applications may be filed, as the State Department requires about three days for this procedure.

PAPERS. When traveling via Lisbon, which is full of spies and where great care must be exercised, unless otherwise directed by A-2 or G-2 [Air Intelligence or Military Intelligence.—Ed.], secret or confidential letters should not be carried, but in cases where they are, they should be deposited at the American Legation during the stay in Lisbon.

When traveling by Ferrying Command, it is essential that officers be in constant contact with the Air Corps Ferrying Command in order to ascertain the actual time of departure. This information, once obtained, must not be disclosed as all information pertaining to flights is *secret*.

MONEY. It is strictly forbidden to take into Great Britain, or out, more than £10 and it is advisable to arrive in London with at least £5 in your pocket. There are no regulations regarding the amount of American currency or travelers' checks which you may carry. When traveling by clipper, it would be well to have a small amount of Portuguese currency for use when landing in Lisbon. The official purchasing rate set by the Bank of England is $4.02 for the pound.

While officers on service in the United Kingdom are not subject to a British income tax, it is recommended that arrangements be made that the payment of allowances be so adjusted as to avoid an accumulation of sterling, in keeping with

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Don P. Smith, President
Interstate Aircraft and Engineering Corp.

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Performance that pulls you off runways faster (take-off run, 275 ft.), over towering peaks easier (service ceiling, 16,000 ft.) lifts you out of high altitude fields quicker (rate-of-climb, 800 ft. per min.) and gets you there sooner (116 M.P.H.). That's the new Cadet 90.

Yet, even with this *extra* performance, you won't sacrifice economy, profit or trouble-free operation. For the Cadet 90, like the famous 65, is engineered specifically for the tough job of C.P.T.P. training—built to be bounced in—treated rough—to be operated from dawn to dusk, day after day—training better pilots, showing greater profits.

In this critical year, choose the Cadet—the trainer exactly powered for the job you have to do. And you'll do a better job—faster and more economically. See them today—these *two* great blue and yellow Cadets—the 90—the 65.

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The Civil Air Patrol is headed by Maj. Gen. John F. Curry, U.S. Army Air Corps. Wing Commanders have been appointed for every State, under whom seaplane and land plane District Squadrons are being organized with Groups and Flights in local communities.

MAIL YOUR APPLICATION AT ONCE

You can obtain an official application blank for enrollment in the CAP from any base manager, CAA Regional Office, State Aviation Official or aircraft dealer. Get yours today. Fill out and mail *directly* to—

Civil Air Patrol
Office of Civilian Defense
Washington, D. C.

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EDO'S PART IN THE PROGRAM . . . Our Government has granted the CAP priority assistance. Therefore, Edo will do everything possible to supply CAP's demand for floats and float parts and to advise on seaplane operations and facilities for the CAP and related civilian defense operations.

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the restrictions against taking out of the country more than the sum already specified.

Here is a rough guide to English currency:

One Pound (paper note)	$4
Ten Shillings (paper note)	$2
Two Shillings and Sixpence	50c
"Half a Crown"—A silver coin larger than a silver dollar with milled edges.	50c
Two Shillings—A florin —a silver coin about the size of a silver dollar.	40c (approx.)
One shilling—A silver coin similar to the U. S. "Quarter."	20c
Sixpence — A silver coin similar to the U. S. "Dime."	10c
One Penny—A large copper coin	2c
Halfpenny—A smaller copper coin	1c

PURCHASING POWER. In connection with these equivalents in the currency of the two nations, it should be pointed out that it is estimated that the purchasing power of the pound sterling in its own country is higher than the same purchasing power of the dollar in America.

LUGGAGE. Pan American allowance from New York to Lisbon is 60 pounds; Air Corps Ferrying Command allows 40 pounds; British Overseas Airways from Lisbon to England, 44 pounds. Overcoat and umbrella are not counted in this luggage allowance.

CLOTHING. The sale of civilian clothing in England is rationed, but officers may make purchases upon signing a form that certifies the clothing is necessary for personal use. In case of any difficulty in this respect, the adjutant of your unit is in a position to be of assistance. Articles are tailored to measure at very reasonable prices. Regulation trench coats, civilian clothing—such as top coats, sport coats and suits of superior quality—are to be had at very reasonable prices.

Uniforms will be worn at all times unless special permission has been given for civilian clothing. Too much stress cannot be placed upon the personal appearance of American officers while on duty in England. Therefore, the uniforms worn should be the best possible. Flying equipment, helmets and gas masks are to be obtained in England. Articles which should be included in one's wardrobe are one O.D. uniform complete with cap, one overcoat or lined trench coat and heavy shoes.

While the British Isles do not experience extreme temperature, there is considerable dampness and warm clothing is essential. The temperature runs roughly from 50° to 55° Fahrenheit.

CAMERAS. Regulations are strictly enforced regarding cameras and photography. It is therefore advised that no cameras be taken with you. No person is permitted to take a camera out of England, in not having one with you, you will undoubtedly avoid difficulty with the authorities.

TOBACCO. As much tobacco and as many cigarettes as possible should be taken with you and your supply should be carefully rationed as both are most expensive to purchase in England.

TIPPING. Adding 10 per cent to the total of your bill in a restaurant, for example, is entirely adequate.

LAUNDRY. One should allow at least a week for laundry and while it will be found less expensive, it will also be found less expeditious.

MAIL. The diplomatic pouch is available for personal mail to and from officers on detail in England. Following instructions are to be strictly complied with: (1) Letters will bear appropriate British postage 2½d per ounce. (2) Sender's name and title and address will appear on envelope. (3) Envelopes will be unsealed. (4) Under no circumstances will mail for third parties be forwarded through diplomatic pouch, either directly or as enclosures to personal mail. (5) No packages, including newspapers or periodicals will be sent to the United States via the diplomatic pouch. From England, unsealed letters are to be delivered to the Mailing Division, Office of the Military Attache, London, to be inspected by designated officers prior to being placed in the diplomatic pouch. (From America, the officer should be addressed "Care of Military Attache, London.") This letter is to be placed in an unsealed cover envelope addressed "Mail Room, Ass't. Chief of Staff, A-2, War Department, Washington, D.C."

LIVING EXPENSE AND CONDITIONS. When on duty in London, the military attache's office is in a position to advise regarding living accommodations in London or equivalent metropolitan area. When assigned to a Royal Air Force field, you will undoubtedly live on the station. This lodging is free. You will automatically be made a member of the officers' mess. This constitutes the officers' club and the location of the mess. In all these an effort is being made to reduce the cost in the interest of junior officers.

All sorts of amounts have been given as to the cost of messing and there is little doubt of considerable discrepancies in charges between various stations. To give a definite figure invites criticism and an estimate should err on the high side to avoid embarrassment. One estimate has been given on the basis of $30 a month. Additional expenses to this are naturally termed luxury purchases, such as shoe repairs, laundry, dry cleaning and haircutting, which it is estimated as being less costly than here in America, and should be taken care of by about $5 a month. Some officers advise upon returning from England that they have experienced no difficulty in living on the $6 per diem allowance.

Under date of September 19, 1941, the Secretary of War authorized the military attache of the American Embassy in London to grant military observers on duty in London or equivalent metropolitan area a grant not to exceed $4 a day as reimbursement for necessary expenses. This $4 per diem additional allowance is granted only to those officers who spend more than 50 per cent of their time in London itself or equivalent metropolitan area, or only upon voucher proof that their expenses warrant it. In general, these expenses may include:

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a. Baths when not included in room rent.

b. Calling cards and invitations for official functions.

c. Cleaning and pressing of personal clothing in excess of $2 per month.

d. Club fees and dues, providing the necessity and nature of club are shown.

e. Entertainment of foreigners at luncheons, teas, receptions, balls, theaters, etc., provided the number and nationality of guests, and date and place are given.

f. Fans and fires in rooms.

g. Gasoline, oil and garage for private car on official trips.

h. Gifts of reasonable nature to prominent foreigners or their wives.

i. Laundry of personal effects of individual officers in excess of $2 per month.

j. Meals (personal) in excess of $25 per month.

k. Rent of personal quarters (lodging).

l. Taxi hire for official trips and social functions.

m. Telegrams and telephone calls on official business.

DISCIPLINE. Upon arrival you will be instructed to report to the Military Attache for Air in London or to the senior Air Corps officer in another given point, where you will be informed of the local situation and matters of policy of the individual offices and be able to make use of the experience of men, who have watched developments over a period of time and who have qualified to interpret the existing conditions in view of the problems which had to be faced.

From the outset you will be subject to British service rules of discipline and in this respect the counterpart of British officers training here in America, who are subject to the rules of discipline with our Army Air Forces. These codes of discipline are identical in purpose and principle, but vary of course in particulars. For example, saluting. In the British service, junior officers salute senior officers, those of field rank (squadron leader in the Air Force, major in the Army, lieutenant commander in the Navy) at all times, but do not salute at each casual meeting. The senior officer of a party of officers walking together takes the salute.

Herewith is chart of comparative ranks for your guidance:

U.S. Army	*Brit. Army*	*Navy*	*R.A.F.*
Sec. Lt.	Sec. Lt.	Sub-Lt.	Pilot Off.
1st Lt.	1st Lt.		Flg. Off.
Capt.	Capt.	Lieut.	Flt. Lt.
Maj.	Maj.	Lt. Comdr.	Sq. Ldr.
Lt. Col.	Lt. Col.	Comdr.	Wg. Comdr.
Col.	Col.	Capt.	Grp. Capt.
Brig. Gen.	Brig. Gen.	Commodore	Air. Com.
Maj. Gen.	Maj. Gen.	Rear-Adm.	Air Vice Marshal
Lt. Gen.	Lt. Gen.	Vice Adm.	Air Marshal
General	General	Admiral	Air Chief Marshal
	Fld. Marshal	Adm. of the Fleet	Marshal of the RAF

TRAVELING. Traveling on duty missions naturally is done by issuing of a railway warrant or pass which, when surrendered at the railway station, entitles one to a gratis ticket transportation. The members of the RAF are entitled to two free railway warrants per year for the purpose of taking annual leave, and should this be your luck, application to the proper quarters will insure similar privileges.

Contacts and friendships must be avoided with individuals unless they are known to be of undisputed reliability. Careless talk and expressions of individual opinion relative to war efforts or military operations are to be avoided at all times.

END

We Can Lose!

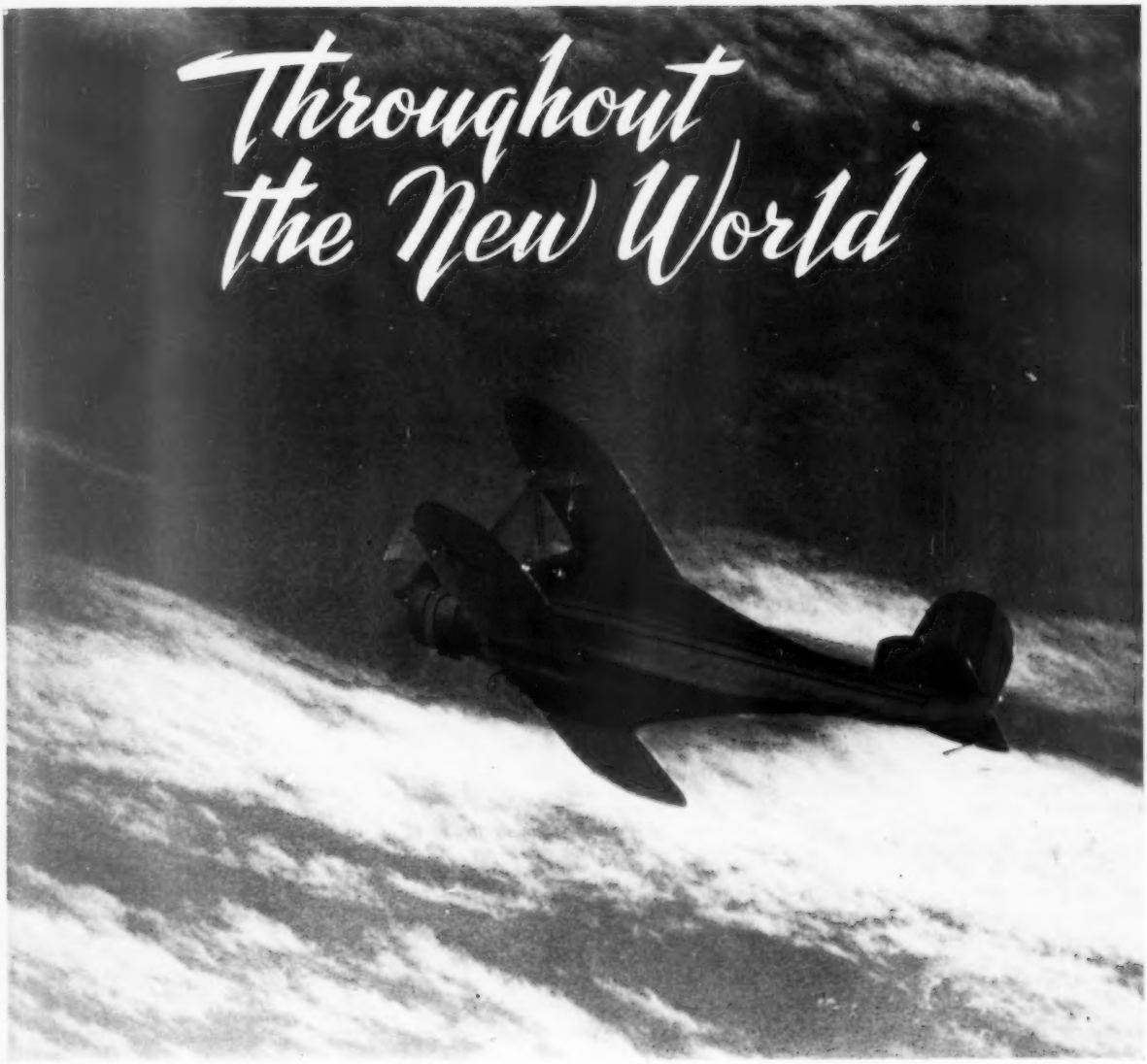
(*Continued from page 41*)

dreamy and incompetent Russians, and pronounce them utterly defeated three months ago? Why did the British first smash the Italians in Libya, then underestimate the daring of the Germans in putting an expedition into Africa? Then, in turn, why didn't the Germans foresee the difficulties of supplying that force, against British naval and air opposition? And why didn't the British, with the submarine experience of the last war before them, have a force of warships adequate to convoy supplies to England, instead of being so weak that shipping losses rose to 5,000,000 tons a year?

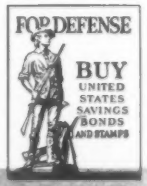
These few examples of misjudgment, lack of intelligent planning and preparation and general inability to foresee probable events could be expanded at great length, piling up proof that while there are experts in various phases of warfare, there seem to be no experts on war, a science so complex that its very immensity baffles its most earnest practitioners. Napoleon, who undoubtedly knew as much about war as anyone, came a cropper on the Russian army and the Russian winter climate.

So, for that matter, did Hitler. It is indeed cheering, in our own muddled and confused national state of mind, to recollect that two of the most efficient warmakers of all time tripped over a thermometer. It assures us that no conqueror is unconquerable, that no early disaster is irretrievable. But it should warn us to profit by the lessons of experience, particularly the air experience of this war, which seems to have been wasted upon our responsible authorities, military or political, or both together, asleep at the switch.

As this is written Manila has fallen, Corregidor still is in our possession, denying the Japs a fleet base. Gen. Douglas MacArthur's army, obviously ill-equipped with tanks and as obviously lacking any effective air support, is fighting a desperate and what appears to be a losing battle. It seems clear that only a miracle can save the Philippines: a miracle of transportation of men, munitions, airplanes, tanks and the thousands of tons of supplies that such a force needs—and across 10,000 miles of sea, in vulnerable



The Brazilian Government has obtained its second group of BEECHCRAFT biplanes, one of which is shown above in flight. Throughout the New World, as in many distant foreign lands, fast-increasing numbers of BEECHCRAFTS serve the cause of Freedom in many vitally important ways.



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transports and supply ships convoyed by our Navy, against the opposition of a possibly—or probably—more powerful Japanese fleet, assisted by land-based Japanese aviation, already in the Philippines, already based in the Japanese mandated islands which flank our route to Singapore.

While long-range bombers can be flown to the Philippines, the gasoline and bombs and ammunition and the facilities to operate them must go by sea. This war in the Pacific is primarily a naval and land war—due to lack of intelligent planning. It should have been chiefly a naval and air war, with special emphasis on land-based (as distinct from carrier-based) aviation. But the evidence of the Japanese bombers flying at will over the Philippines, now with little or no interference from our pursuits, shows in unmistakable terms that our air power in those islands is almost non-existent. Unopposed Japanese planes have ruthlessly bombed Manila; they have smashed bases and shipping; they have covered the landings of their troops swarming up the beaches to attack the American and Filipino forces and drive them into the mountains. None of this could have been effected if we had possessed an adequate air force in the Philippines.

The defense of the Philippines should have been conceived along this basic strategy—no secret—but a strategy that has been discussed in Army Air Corps circles for many years past—at least 10 years, to my knowledge: The defense of those distant islands must depend primarily upon our ability to supply them with the weapons of war, and to keep them supplied, for they make nothing of their own and cannot of themselves replace the losses of war. This means naval forces strong enough to convoy those supplies against the expected opposition of a Japanese fleet, plus the opposition of Japanese land-based bombers from Formosa or the China coast and also carrier-based Jap aviation.

Against such expected opposition, naval and air, it should be obvious—and was obvious to many Air Force officers if not to the General Staff—that our Navy alone, with its air arm, would not and could not be sufficient. What was needed, therefore, was our own land-based aviation in the islands themselves—and not on a few air bases that conceivably could be bombed to destruction, but spread out and dispersed over many war-operational flying fields. The numbers of bases and the numbers of planes needed for the defense of the Philippines, I shall not try to estimate, for factors not within my knowledge enter the problem. But ordinary common sense should have dictated that enough air power should have been in the islands, not only recently but for many years past, adequately to defend them. And if, as the war went on, the enemy, nearer to his source of supply by many thousands of miles, should at last have managed to overwhelm our air defenses by the use of superior numbers, we at least would have made him pay dearly for his gains. In fact, we might so have weakened him—even though he won in that theater—that his farther advance to the south, to Malaya and Singapore and the Dutch Indies, might have been long delayed, or even held off until the Japanese nation fell victim to exhaustion of its resources and be forced to give up the struggle.

Such a strategical conception involves no strain whatever upon the military and political planning minds of our nation, for every bit of it is time-honored Air Forces thinking, its soundness amply proven by the experience of the British during the past year and a half in the defense of Britain. Like the Philippines, England, Scotland and Ireland are islands, separated from their powerful enemy on the continent of Europe only by a narrow stretch of water, 22 miles across at its narrowest part, little more than a hundred miles at its widest. Surely there is an ideal condition for an invasion by sea, supported by nearby land-based German air power. Yet, with the British Expeditionary Force evacuated from France with the loss of all of its equipment, with only a partly trained home defense force standing guard in England, the huge German army found it inexpedient to attempt invasion—though their shipping and barges could have got across the Channel in the darkness of a single night, unless they were attacked and sunk en route.

Why didn't the Germans attempt that invasion any time during the past year and a half? Because the German air force never managed to wipe out the powerful RAF of Great Britain and never managed to attack and destroy enough British warships to render the attempt other than an extremely hazardous and doubtful one. To a large extent the existence of the British Home Fleet, but to a far larger extent the magnificent fighting qualities of the vastly outnumbered RAF, is responsible for the failure of the German-planned invasion to come off. Incidentally, permit me to hazard the opinion that when and if Hitler finally determines to risk invasion of Britain, his first objective will be an invasion of Ireland by parachute troops, air-borne troops and tanks and armored cars and supplies carried in large gliders towed by transports and bombers. Ireland, with its small defense force, bears an ominous resemblance to Crete or Norway. In the hands of an enemy with a powerful air force, it will prove an effective stopper to the already narrow bottleneck through which supplies from the Americas, of food and munitions, now pour into Britain.

If the Philippine Islands had been protected by an American air force of any strength, the task of the Japanese invaders would have been far more difficult, far more hazardous, than a German invasion of England—though less difficult than a German air invasion of Ireland. Instead of crossing a narrow channel during a single night, the fleets of Japanese transports, numbering in all nearly a hundred ships, exclusive of landing barges and motor boats, had to come 300 miles or more from Formosa, nearest Japanese island; much farther from many other bases. An efficient American air force, had it been in existence in the Philippines, could have taken a costly toll of these vessels while they were yet far distant; could have rained destruction upon them when survivors of the journey reached the beachheads. Dive bombers could have made a shambles of those transports and of the landing barges, precipitating men and guns and tanks into the sea and preventing the landing of more than a few scattered and thoroughly disheartened groups, easy victims for our Army. Against the opposition of a strong American air force—not thousands of planes, but perhaps as few as 500 bombers and 200 pursuits,

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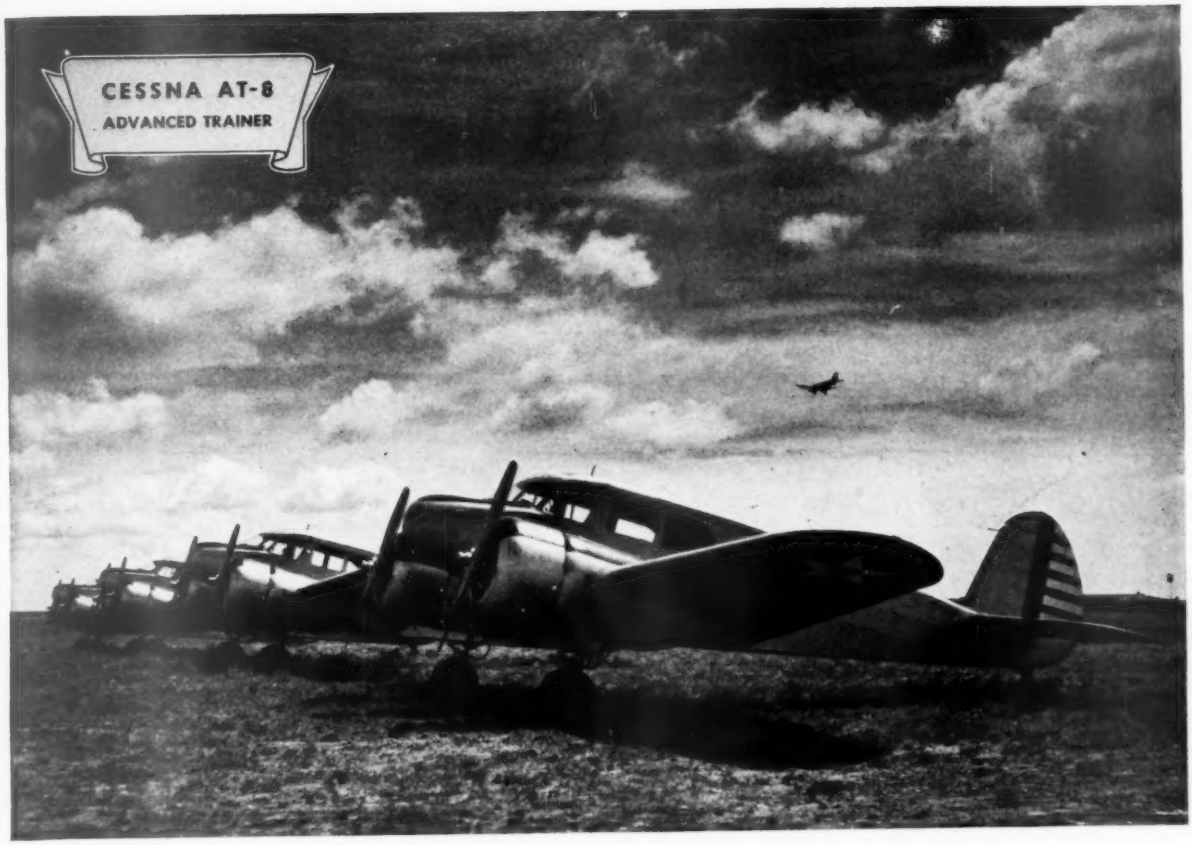

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though I'm guessing, it would seem to be utterly impossible for the Jap invasion to have succeeded. All of this, I assert, could have been foreseen and *should* have been foreseen after the lessons of British-German non-invasion experience.

Now the Japanese are on the islands with their own air force, in what numbers we are not told. Naturally those numbers will be reinforced. The American air opposition that the Japanese navy and transports and air force should have faced, and knew to be practically non-existent, has been replaced by Japanese air forces. And it is the Japs who now enjoy the military advantages that we should have enjoyed for at least the last five years during which Japan demonstrated her intention of unlimited expansion. It may be asserted that by our failure to assess air power at its real value we have made the Japanese a present of the Philippines, when we easily might have held them, or made the cost of their taking excessively high.

Now, although for many years—and especially since that great American air strategist, Gen. Billy Mitchell died—I have been urging the creation of a distinct American Air Force, in addition to the Navy and Army air forces that work in close co-operation with those services, I feel that in the turmoil of a great war nothing should be done to disrupt our two functioning air organizations, but that every effort should be made to give increasing power to those experienced airmen of the Army and Navy and take it away from slumbering admirals and generals, who all these years have been so indifferent to the growing importance of air power that they have not considered it of interest even to learn to fly.

Had we possessed an independent air force, in addition to aviation that properly belongs to the Fleet or the Army, I feel that the disaster in the Philippines would have been avoided. For there, more even than in continental United States, was the need for a strong air force to oppose an enemy who could fly over our Navy, fly over our small Army and win command of the air. Our airmen could see that—our admirals and generals in high places evidently could not—unless they asked for adequate air protection and were denied it by political authority.

We must remember that officers in command of our armed forces do not always get what they ask for. Political authority outranks military authority. We have long pursued a political policy of appeasing, in fact until last summer, of aiding the Japs—and aiding the Chinese at the same time, an odd contradiction of policy. Perhaps it was considered inexpedient to base a large air force in the islands for fear of annoying the Japs. But that policy was a futile one, for the Japs have been annoyed with us for a quarter of a century. Whatever the reason and whose ever the blame, this fact stares us in the face: Political expediency or military ineptitude, which failed to appraise correctly the vital need for air power in the Philippines, has brought bitter defeat in the opening moves of this war.

The road to victory will be a hard one and a long one. To paraphrase General Forrest, the victory at last may be won by those who get there fustest with the mostest airplanes. So much, at least, our enemy seems to have demonstrated to us in the Philippines. May we, in good time, confirm that in Tokio.

END

Camouflage School

AT Belvoir, Va., the Army's camouflage school, miniature models of airports, factories and battleships are studied to find the effects of various paints and designs for concealment of ground objects from aerial observers.

Check Pilot

(*Continued from page 55*)

plained that once in the air over the field, I would require them to take the map and fly me to the designated point by map-reading and use of the compass.

A typical flight was with a man much older than myself who had flown in the last war and was going to England to join the ATA.

We were carefully strapped into our seats, I in the rear. Gosport helmets were used which allowed two-way communication. On my knee was strapped a test pad. I gave him the signal to taxi out to the runway (allowing the other fellow to taxi gives him some feel of the ship and more confidence before take-off.)

We stopped at the end of a concrete runway. Here I ran through a systematic cockpit check from force of habit; then a final reminder to the front seat: "Flaps up, mixture full rich, prop low pitch, head temperatures, oil, gas, all okay, don't forget now—32 inches for take-off, climb at 95 and, when I ask you to level off, use coarse pitch and 25 inches. Altimeter all set? Okay, its all yours."

I lean back, my left hand resting lightly on the throttle, right hand around but not quite touching the stick, my feet held just off the rudder pedals, a pencil clamped in my teeth. The engine roars, we roll smoothly forward. When the airspeed reads 68, we're off and climbing steeply. I tell him to push the nose down to 95, which he does just before we stall. I haven't touched the controls because I want to find out what he will do himself, and because I can't tolerate an instructor or check-pilot who rides the controls. We're climbing steadily now, and I make a note on my test pad "Stalled off, no swing. Boost okay."

At 500 feet, I ask for a climbing turn to the right. "Skidding badly. Okay to the right." We straighten out at 5,000 feet. I notice that he brings the prop back into coarse pitch, which is proper. We are over the Ottawa River now and I tell him to do a spin to the left and let it spin till I yell "bring it out."

The throttle comes back, the airspeed drops to 110, 100, 85, 70. "Okay, kick her in." We lurch into a fast spin—one, two, three times—"Okay, pull out." The stick goes forward just a little, then opposite rudder. I make a mental note "light-plane pilot" and watch his face in the rear view mirror. Still spinning, his neck gets red, a scared look comes into his eyes; suddenly he grabs the stick in both hands and shoves. There is a loud bang as the fire extinguisher flings from its moorings. The ship straightens viciously as it whips almost onto its back, throwing both of us hard against our Sutton harness. I manage to catch the last few inches of stick travel in the palm of my hand or we would have done the first half of an outside loop.

I shout: "I have control" and straighten out at about 1,500 feet. On my test pad, I scribble "spin recovery, not enough

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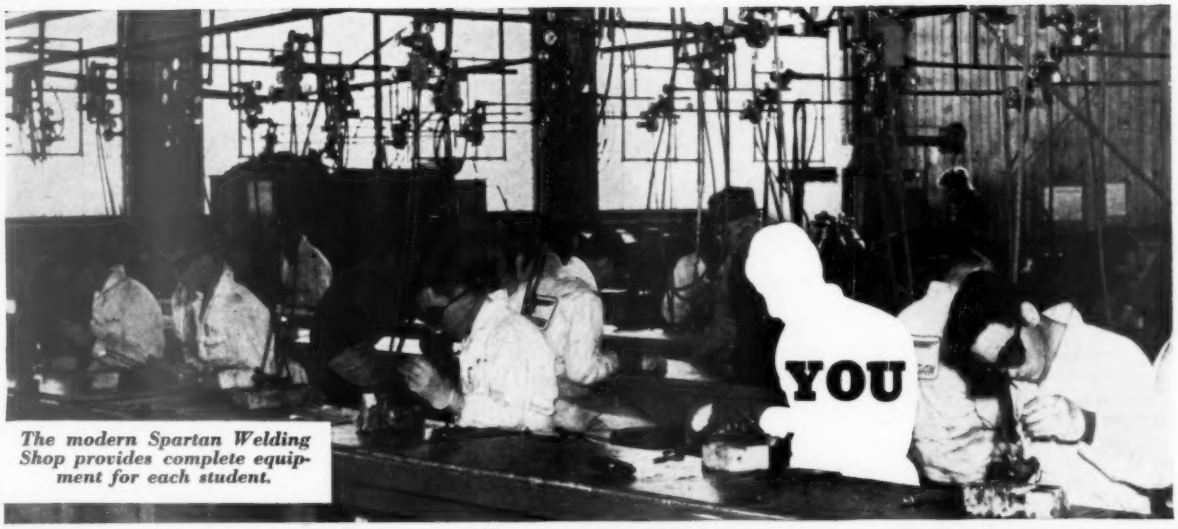

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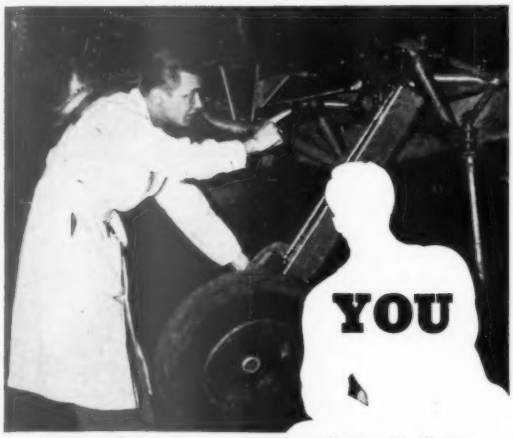

(Above) Instructor explaining Hydraulic System of retractible landing gear.

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control—vicious recovery." I climb back to 2,200 feet while he regains his composure. I have already asked him if he likes aerobatics to which he nods in the affirmative. So I do a loop, a slow roll, then a roll off the top. The report must carry his reaction to aerobatics, and it also gives me a chance to blow off a little steam.

He seemed to enjoy my little show, so I reach forward and hand him the map. I settle back and relax for the short cross-country. In a few seconds, we are oriented and heading northeast over the Laurentians for the point marked on the map. Another notation on the knee pad: "Map reading okay, cruising 25 inches, pitch coarse, altitude steady."

We start back for the airport and I have him do a medium-bank turn to the left, then a steep turn to the right. I allow for an irregular turn because of a strange airplane. But this *steep turn!* The airspeed goes from 130 to 80, then quickly to 160 as the nose drops steeply toward the wooded slopes below our left wing tip. I tell him to straighten out as I make a note "medium turns average—steep turns, bad slips and skids, airspeed 80 to 160." By now, I am sure we don't want this pilot. Still, his cross-country was good, he didn't forget pitch, his medium turns were okay and, after all, this is a fast maneuverable airplane to a civilian pilot.

Before we left the ground, I had warned him that I would close the throttle on him sometime during flight for a simulated forced landing. Underneath us are some good fields, so I close the throttle and shout: "Forced landing." We are at 2,000 feet. We make a rapid descent, heading for a large green field bordered by pine forest. At about 400 feet, it is evident that our excess speed is carrying us well beyond the field.

I shout up front: "Why don't you use your flaps?" I receive an answering nod of the head and looking down by my left knee, notice the fuel wobble pump being drawn steadily and slowly backward. My friend up front is gradually putting on more flap by pulling back on the fuel pump handle!

As if this wasn't enough!—now came the prize stunt of this hectic ride: in disgust, I shout: "Okay, take her back up." Burp—burp—plop—the engine is quitting at about 100 feet over those pine trees. I grab the throttle with one hand, shove the mixture control back into "rich" from "lean" where he had just put it and, by dint of some furious pumping of the wobble pump, holding the stick in my knees, I manage to get it running smoothly just in time to pull the wheels away from the tops of those mean-looking pine trees.

Back at the hangars again, my report read "Unsatisfactory for ATA ferry service." True, that man could probably have been trained, eventually, to do a much better job of flying that particular ship, but we needed good pilots. If I had passed him on his test, it would have been only a matter of time until he would have made one of the serious errors which his flying indicated he would make and the result would be not only the loss of a life, but quite probably the loss of an expensive, much-needed military airplane and the time necessary to replace the pilot.

That pilot undoubtedly was at one time an excellent pilot. But he had not kept pace with modern flying. He was still trying to fly the airplanes of his youth which were much simpler and easier to fly and did not require the quick thinking and action necessary to properly handle the modern military airplane.

In contrast to that case were two young fellows named Almos and Stepp, 19 years old, and sent to me for entry into the American Eagle Squadron. They were the two best pilots I tested for the job. Both had approximately 280 hours apiece and had just graduated from a large flying school in the middle west. Their experience was extremely little as compared to the many veterans I flew with during this period. However, their flying had all been carefully supervised and intensive instruction in modern equipment, and their flight tests showed it.

Time and time again, it has been proven that the pilot with a comparatively small number of hours of intensive, precise training in modern equipment is a better and safer pilot today than is the fellow who has "so many hours I quit logging them" in barnstorming or haphazard flying, without ever having had a good course of instruction.

An outstanding example of the above statement was the crop-duster whom I tested, who had 4,000 hours. I later checked and found that his time was just about correct. Yet that man almost killed both of us. He was a big husky southerner with a slow, lazy way about him—used to low, close flying in big heavy biplanes. When I asked him to do a pylon turn for me in the *Yale*, he hauled back on the stick so hard that we stalled at about 100 m.p.h., and went into the start of a power spin at about 1,000 feet with about three-quarter throttle. I tried to take over conrol, during which time he kicked on full opposite rudder. We ended up in a screaming sideslip down in between two hills with a row of hay fields underneath us and more hills looming up in front of us. I cut the switch and managed to hold it level so that we hit in the middle of a good-sized field in a slide-slip. Why that landing gear didn't collapse I'll never know. When I finally recovered my voice enough to ask him what the idea was, he drawled: "I reckon it ain't got near enough wing for a good turn."

In this day of mass-production pilots and government-subsidized flying courses, there is gradually being developed the feeling that pilots are becoming a dime-a-dozen and that after the war, pilots will be just so many chauffeurs. That may be so. However, out of any 1,000 pilots chosen at random, there can be found only a small handful who are experts to be trusted with fast, modern equipment, either military or commercial; who know radio, navigation, weather and who are truly skilled pilots under stress or in an emergency.

The problem arises: who is to choose this small group of really competent pilots out of a group of perhaps a thousand men, all armed with licenses, a large majority of them earned only in light-planes? That is where the check pilot comes in, as only an expert pilot with an extensive and varied background can tell a competent pilot from a poor one.

The check pilot's job consists of the following points:

1. A good knowledge of the flying job for which he is testing pilots. For instance, an airline pilot, no matter how experienced, is not fit to check out pilots

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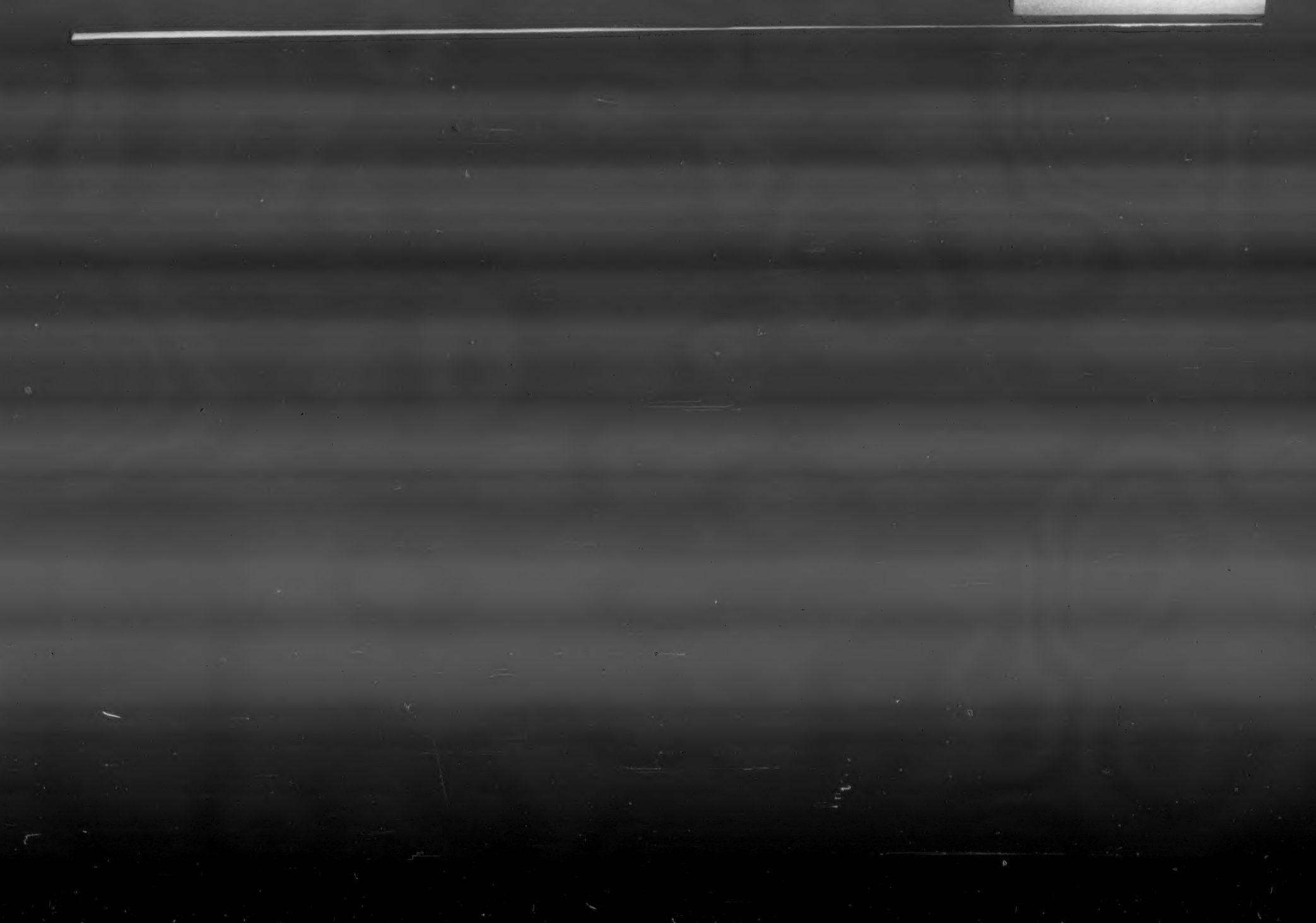

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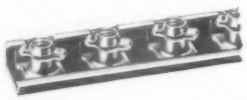

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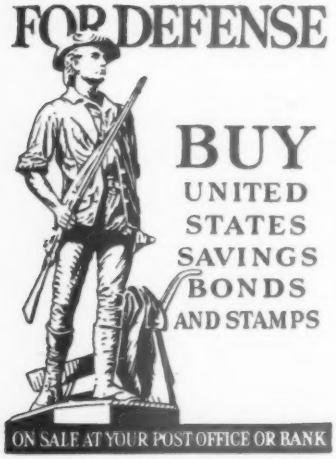

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for the job of ferrying all types of single and twin-engined equipment in England unless he knows the exact type of contact flying, balloon dodging, and so on—these ferry pilots do—and something about the English airplanes they will fly.

2. He must himself be an above average pilot, preferably with a good background as an instructor.

3. He must have a personality which will inspire confidence in the pilot to be tested.

4. He must have a full appreciation of the fact that the man he is testing may be an exceptionally good pilot, but has never flown that particular type airplane before. Therefore, he should be able to clearly point out the peculiarities of the airplane being used for the test.

5. He must not confine his judgment to the actual performance turned in on one particular flight, but will take into consideration many important factors such as the background of the pilot being tested, his original training, his experience, his attitude towards flying in general—and last but not least, during the actual flight test, he must remember that the pilot whose technique is good and who has a systematic way of doing things is preferable to a pilot who is haphazard and careless, even though the latter might hit a designated spot on the ground to the inch, by some lucky break, when the first and better pilot may have missed it.

The RCAF offers a splendid opportunity for a pilot to gain experience in flying modern fast equipment to which as a civilian pilot he would not have access; and at the same time be performing a real service in a good cause. For the aid of anyone who might be contemplating such a step, I would offer these suggestions:

1. Get as much flying time as possible in ships of over 100 h.p., low-wing monoplanes preferred.

2. Concentrate on precise flying. Ten hours spent practicing precision turns and forced landings are worth 50 spent joy-riding around the country.

3. If possible, beg, buy or borrow at least a couple of hours' instruction in an airplane that has over 250 h.p. and lands at least 50 m.p.h., simply for the psychological effect of flying something which you heretofore had always considered "hot" and beyond your capabilities. You will find it not near as difficult as you had thought.

4. Finally, when you do come up for your flight test, be honest about your flying time and experience.

END

Firepower

(*Continued from page 46*)

plete stoppage of fire. In many instances, electric "feed boosters" are being used to help the gun pull the ammunition belt, while another trick is to have the belt ride over rollers.

Ejected belt links and cartridge cases are carried from the gun, through chutes, to a retainer box or to an outlet through which they are dropped from the airplane. Improper designing of the ejection chutes may cause the collection of links and cases, resulting in jams. When ejected links and cases are discarded, care must be exercised in choosing the point of outlet, as the airstream around the airplane is unpredictable and might lead to damaged tail surfaces, wings, enclosures, etc.

An example of ejection chute problems was presented in the Curtiss XP-6 airplane, with its .30 and .50 caliber synchronized machine guns in the fuselage. In this particular airplane, it is said, the cases from the smaller gun hit the lower wing and bounced towards the cockpit, while those from the .50 caliber gun hit the other bottom wing, but didn't bounce, tearing holes in the fabric covering. This surprising condition was quickly corrected by rerouting the chutes and placing the outlet below the lower wing.

The charging systems for aircraft machine guns are of great import and provide the means of clearing certain types of malfunctions, as well as providing a "safety" for the guns. Charging is ordinarily accomplished by the gun recoil, but must be done by manual or hydraulic forces when a jam or a "dud" shell is encountered. Mechanical charging is executed through the use of cables and pulleys, leading from the guns to charging handles in the cockpit. Since a charging operation often requires heavy pulling loads, hydraulic charging mechanisms are receiving wide acceptance. Hydraulics, however, do not seem to be the final answer in this case, as the pressure lines must be heated to prevent the oil from becoming sluggish at low temperatures.

As previously mentioned, gun barrels will overheat, even at the low temperatures encountered at high altitudes. So their proper cooling must be insured. Conversely, the bolt and breech mechanism must be heated, to prevent the lubricants from freezing. In close connection with gun heating and cooling enters the aerodynamic fairing of wing

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P. A. MARCH 1942

guns to avoid a decrease in wing lift. In British aircraft, when guns are completely enclosed within the wings, the "gun-ports" are covered with adhesive tape, thus providing maximum lift until the guns are fired.

Very few people realize that firepower and simplicity of design go hand in hand. Yet very little explanation is needed to clarify this relationship. For instance, a battery of 12 guns might provide excellent firepower for an airplane, and several of these planes might mean similar firepower for a few squadrons. But, through simplification in design for mass production, several tactical groups might possibly have been equipped with this type of firepower in the same length of time required to equip a few squadrons. The ultimate goal is to provide an entire air force with superior firepower, not just a few units of that force.

In line with simplicity of design is the use of interchangeable assemblies and standard parts. Their use requires less skilled labor, less engineering time and fewer spare parts for maintenance crews to carry in "field" operations. It is for this reason that the older types of aircraft are assigned to foreign stations, as the parts most frequently needing replacement are known and a sufficient supply is stocked. This was evident in the replacement of the P-35 by the P-36, which in turn was replaced by the P-39 and P-40—the replaced craft being transferred to foreign service.

The advent of aircraft cannon is not new. As is commonly known, their use was tried during World War I, both as flexible mounted (Voisin) and stationary (S.P.A.D). In present aerial strategy the rapid-firing cannon is receiving wide acceptance, having rates of fire comparable to machine guns. The aircraft cannon enables the airplane to cope with lightly-armored tanks and, as larger caliber aircraft guns are developed, "panzer" divisions will require heavier armor, consequently decreasing their speed and mobility. When used against hostile aircraft the cannon is far more destructive than the faster-firing machine gun, as its explosive shells prove effective against self-sealing fuel tanks.

Previous to the capitulation of France, French aircraft with cannon downed enemy planes by remaining beyond machine gun range; German airplanes not, ordinarily, being equipped with cannon at that stage of the war. The original theory adopted by the British, concerning mixed installations of cannons and machine guns, was for the pilot to use his cannon for long-range firing and his machine guns for close-in dog-fighting. However, as might be expected, the pilots invariably blast away with all guns, whenever the chance for a possible hit presents itself.

At present, the cannon gives the advantage of range to the pursuit and fighter type airplanes, but a flexible-mounted cannon installation, now being developed, will probably neutralize this temporary advantage.

Bombs seldom are recognized as an important part of an airplane's firepower, especially as a form of armament to be used against other aircraft. Nevertheless, a tactical strategy that might be used by pursuits against hostile bombers could consist of the dropping of small fragmentation bombs with time fuses. When attacked by pursuit craft, the most effective defense for a bombardment squadron is a close formation, permitting the gunners to provide mutual protection for other craft in his flight. Thus, we can see, the dropping of bombs would force the bombers to open formation, lessening the chances of more than one plane being downed by a single bomb, but canceling the mutual protection strategy.

The installations for bombs and bomb racks include release and arming controls, and their positive action must be insured. The release control permits a selection of which bomb it is desired to drop (all bombs may be dropped simultaneously by throwing the release handle to "salvo" position). The arming control provides a safety position for the bombs and the control handle can be positioned in one of two selections—"armed" and "safe." When armed the bomb will explode on contact or timing and, when safe, the bomb will not explode when released. The arming operation of an aerial bomb is quite similar to that of a Mills grenade, having an arming pin that remains with the bomb rack when bomb is dropped armed, and with the bomb when dropped safe.

Gun cameras, also, form a part of the gun installation, operating in conjunction with the machine guns and making a pictorial record of all gun firing, thus serving as a means of curbing habitual gunnery mistakes.

The manufacture and use of protective armor is an industry in itself, with a history dating back to ancient Greece. In aircraft, armor plating was successfully used in the all-metal Junker airplanes during World War I and, after being rather slighted for about two decades, has now become of prime importance.

The installation of protective plating in aircraft requires careful designing since such plating is heavy, must be removable and cannot be used as a part of the airplane structure. The major design consideration is for maximum protection, with a minimum amount of armor.

In general, there are two types of armor plating, one consisting of two or more fused plates of different hardness; the other consisting of a single-face hardened plate. In all cases, the hardest surface is the one receiving the initial impact. The back surface, being more ductile, tends to prevent the plate from cracking.

Armor plate, when improperly installed, can be of sufficient thickness to withstand gunfire and, at the same time, be detrimental to the safety of the pilot and his plane. The extremely hard surface of protective plating is liable to shattering when subjected to the impact of gunfire, and resultant vibrations are capable of transmitting the impact to any attaching rivets, subjecting the pilot and adjacent equipment to flying rivets and steel splinters. Vibrations, caused by gunfire impact on armor plate, will probably cause serious difficulties in the near future with the introduction of pressurized cockpits, as such vibrations within an airtight enclosure will subject the pilot to very dangerous air concussions, similar to those experienced in tanks.

Throughout the comparatively short history of aerial combat, gun location has had the greatest effect on warplane designs. World War I saw the frenzied efforts of all nations develop the synchronizing system, on the theory that guns located within reach of the pilot and in front of him would improve gunnery. In the present conflict, guns have moved to the wings, where maximum firepower is not decreased by synchonizers. However, in contradiction to the belief that synchronization slows down the rate of fire, the latest Messerschmitt Me-109F is reported to have no wing guns, its armament consisting of two synchronized fuselage guns and one cannon, the latter firing through the prop hub.

In regards to two-place and multi-place aircraft, gun locations are more dependent upon the individual airplane design and its tactical purpose. For instance, when the Boulton Paul *Defiant* first saw action, its tactics completely surprised German pilots—namely, flying alongside the Nazi craft and blasting away with a broadside from the four machine guns mounted in the power-turret. Presumably, the Nazis were not long in locating the *Defiant's* weak point, as rumors were soon circulating concerning British experiments with remote control machine guns, mounted beneath the *Defiant's* tail and covering that blind spot.

In close relationship to the gun location on pursuit craft is the gun alignment. The importance of alignment can be readily understood and, by referring to Figure 3, the advantages and disadvantages of various methods are easily recog-

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nized. The superiority of the twin-engined fighter over the single-engined type, in respect to gun alignment, may eventually lead to its preference, as the guns and cannons require little or no convergence to obtain concentrated firepower. Also, synchronizing is not required.

The introduction of power-driven turrets has greatly increased the defensive firepower of multi-place aircraft by increasing the efficiency of the gunners. They eliminate the awkwardness encountered when attempting to reverse the direction of firing, speeding up the movement and enabling the gunner to remain seated in one position, in respect to the gun and gunsight.

Power-turrets may be of mechanical, electrical or hydraulic operation and, while the gunner revolves horizontally with the turret in all present designs, he may not revolve in the vertical plane with the gun and sight. Naturally, it's most advantageous when the gunner revolves in all planes, with the sight.

Thus, we see, firepower is not accomplished as easily in practice as would be expected when theoretically conjectured. In production, the motto "Get 'em Flying" is well chosen but, in actual combat, firepower is the determining factor that will help our pilots "Keep 'em Flying."

END

Airlines' Future

(*Continued from page* 34)

planes may also permit broadening mail service to thousands of communities. There are about 750 cities with populations of 10,000 or more who do not have any air mail service connections whatsoever. This development, in turn, will bring in its wake an extensive system of feeder lines connecting with main lines.

The successful realization of all these plans as they relate to special equipment for the various operations—passenger, mail and express—will see the expansion of commercial air fleets to the thousands from the seemingly puny total of about 350 at present.

Table 1
AIRLINE OPERATIONS IN THE UNITED STATES

Year	Revenue Passengers Carried (000)	Revenue Passenger Miles flown (000)	Av. Pass. Fare Per Mile (cents)	Express Carried (Pounds in 000)
1941*	4,250	1,340,000	5.1	22,500
1940	2,728	1,041,174	5.1	14,188
1939	1,717	677,673	5.2	9,514
1938	1,177	476,402	5.3	7,336
1937	959	407,296	5.4	7,127
1936	911	388,242	5.6	6,959
1935	663	279,376	5.7	3,822
1934	462	187,859	5.9	2,133

*Estimated.

The airlines during 1941 grossed less than $100,000,000. Some conception of the market ahead for the air carriers may be gained by looking at some railroad figures. Freight revenues of the steam railroads amounted to no less than $35,000,000,000 last year or more than 350 times that of the entire gross of the airlines. Railroad passenger revenues alone were more than $400,000,000 or about six times the airline's counterpart. Total mail income of the railroads was in excess of $100,000,000—a little more than the entire airline revenues of last year.

Table 2
TOTAL AIRLINE REVENUES AND THEIR SOURCE
(All dollar figures in thousands.)

Year	Passenger Revenues	Mail Revenues	Express Revenues	Total Revenues
1941*	$68,500	$21,500	$ 3,000	$94,000
1940	52,933	19,561	2,076	75,841
1939	35,066	17,782	1,615	54,463
1938	24,876	15,041	1,264	41,181
1937	21,791	13,100	1,272	36,163
1936	20,935	12,433	1,013	34,381
1935	15,811	10,662	642	27,115
1934	8,631	8,804	434	17,869

*Estimated.

The railroads may have had their troubles in recent years. Compared to what they are in for after the war, however, will make the previous period appear a happy one indeed. This is just another way of saying that the airlines are on the verge of entering an expansion era in their development, the like of which will make industrial history.

END

From Headquarters

(*Continued from page* 35)

reached their 23d birthday.

Some of the well known aviation men recently promoted include Eric Nelson, Jack Knight, and Ted Curtiss, now lieutenant colonels. Merian Cooper, right hand man to Gen. 'Mike' Scanlon of A2 Air Staff, is now a major. Robert Olds is a brigadier general—a just reward for a job well done on the Ferrying Command.

* * *

Although so many civilians indulge in cocktail parties that in one hotel at five in the afternoon the lobby is full of tables and looks like the *Cafe de Paris* sidewalk cafe, very few uniforms are seen amongst them. Have heard it said that the Army and Navy officers are busy at cocktail parties daily. This statement is not true. They are too tired to indulge. They work here seven days per week on an average of 12 hours a day. Consequently they are too tired to accept the dozens of bids they get daily for refreshment.

* * *

Gen. Donald H. Connolly's appointment to General Arnold's staff to aid the latter on civil aviation matters meets with general approval. The Air Service was helped immeasurably by the talents of two fine officers of the Engineer's Corps in the last war, Maj.-Gen. Mason M. Patrick and Col. William Sherman, and the presence of General Connolly is reassuring.

* * *

Van R. Sternbergh of the chief's office (General Menoher) Army Air Service, World War I, has been commissioned in the Air Force Intelligence.

* * *

Little need now to worry over non-recognition of air power. The talk going on here since Pearl Harbor runs about like this: "It (air power) neutralized our floating 'Maginot Line' in the Pacific. Intelligently handled, it swung our Naval supremacy there over to our enemy. The President never even mentioned Navy production in his message to Congress."

END

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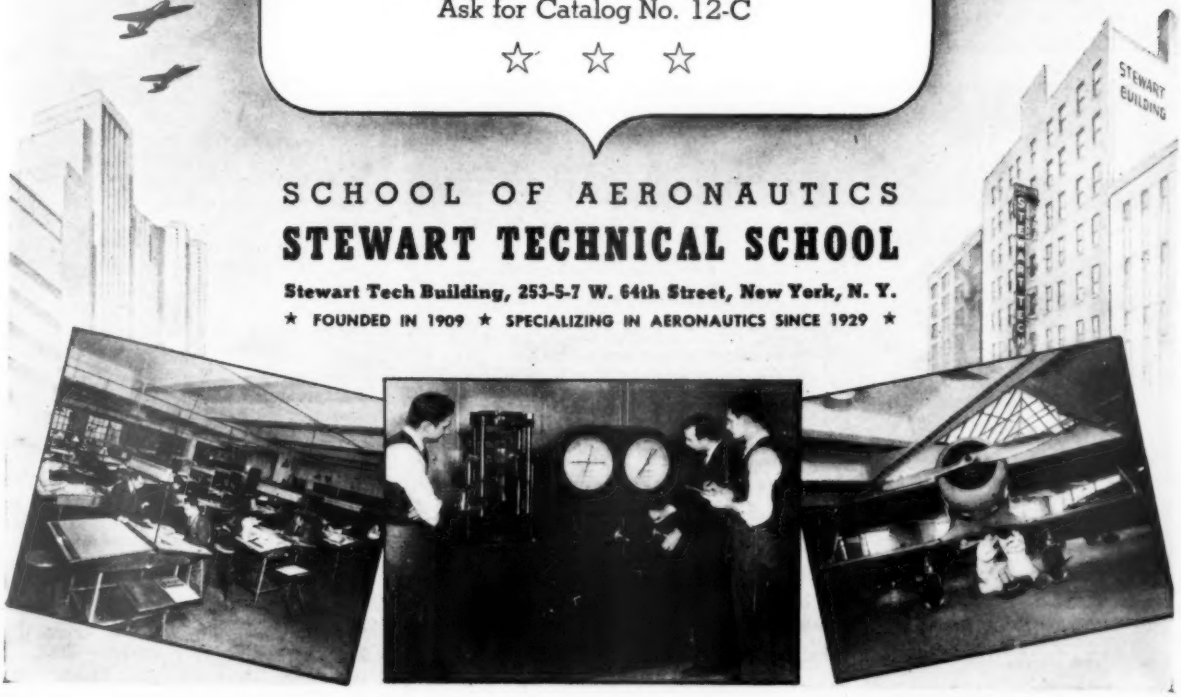

Aero Insurance

(*Continued from page 31*)

tives. Most of the filing cases are filled with policies, but two of them contain pilot histories. These histories give flying experience of pilots insured by Aero, with notes attached if they have had accidents. Such records are used to give information for prompt approval on difficult flights where Aero wants only pilots approved by them to do the flying. By referring to these records, the company can determine how good a risk any pilot is on whom a file is kept—and there are thousands.

The types of insurance handled can be divided into personal accident and liability coverage and "ground risks" and "flight risks." Until last May there had been marked lowering of rates in all the dozens of kinds of insurance. At that time, however, an increase in accidents forced premiums on hull insurance up, although the personal accident insurance rates continued to come down. This shows that flying is safer for the pilot, but his plane has more chance of being damaged. These changes are principally the result of the stimulus of the CPTP and the increased use of aviation facilities by nonpilots. Other factors that govern insurance rates are the changing conditions of the aircraft industry, such as new types of aircraft as well as new grades of pilots' licenses, new uses for airplanes and changes in Government supervision.

In 1939, coverage for a private plane for fire, windstorm, land damage and theft was $5.65 per $100 valuation with a deductible in case of loss. Now $3.50 buys an all-risk policy for a plane not in flight, with no deductible. In two years the rate has been sharply reduced, and the policy has been extended to cover more possible sources of damage. Two years ago it cost a pilot $75 for insurance to cover injury to a passenger riding to his plane. He can buy the same passenger liability insurance now for only $50.

Aero Insurance is experimenting with a low rate comprehensive policy for lightplane owners that has lost money for them in the past and continues to lose. But they're willing to gamble on the chance it will eventually catch on with plane owners. Late winter of 1938 heralded the beginning of the standard lightplane policy, which insured the owner against damage to the plane aground or in flight from almost any type of accident, for 10 per cent of the plane's value. This is an exceptionally low rate and was offered more as an experiment than as a matter of permanent policy. It lost so much money that the rate was raised in February, 1940, and again in May, 1941. Even so the large amount of damage caused by windstorms, taxiing accidents and crashes still makes it a money-loser.

In all policies covering crash, there is a deductible or participation clause. Participation means the owner pays a percentage of the loss varying from 20 per cent to 40 per cent. This is done, the officials say, "to increase safety by giving the assured part of the financial risk." One gets the impression talking to Aero men that they are not selling insurance, but are crusading for safety in the air.

As a matter of fact, none of the employees of Aero Insurance Underwriters does sell insurance direct to prospects; all sales are handled through local agents who may represent 20 or more insurance firms. Aero Insurance is not only an insurance concern, but also the aviation department of its member companies. Policies are taken out on the member companies, but are handled entirely through Aero Insurance, which is supported on funds from its member firms.

Besides the home office, Aero Insurance has branches in Chicago, Kansas City, Los Angeles and Montreal, and field offices in Boston, Atlanta, Dallas and San Francisco. Each of the field offices is in reality a service center from which special agents service the insurance company representatives in their territory. A constant stream of safety literature goes out from the engineering department to the branch offices, special agents, salesmen and finally to aviation devotees.

By virtue of the innumerable contacts made every day between salesmen all over the United States and Canada with pilots, Aero Insurance has a sensitive finger on the pulse of the civilian flying world. Each significant move on the part of the Government or airplane manufacturers that affects civil aeronautics is reflected in the home and branch offices of the company through the reactions of pilots and other assureds.

When Aero Insurance employees mention the risks involved in flying they know whereof they speak. Many of them are licensed pilots. Among them are A. Norton Prentiss, northeast repre-

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FEBRUARY ISSUE

★ **RADIO NEWS** ★

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sentative; Francis Lieber and Charles B. Ripley of the engineering department; Walter C. Libbey, assistant to the production manager; Jean H. Dubuque, manager of the Chicago office, formerly with the CAA, veteran instructor and author; Hayden J. Chenet of the Kansas City office, who is a CPTP pilot from New York University; Anthony Wisner in Los Angeles; Gus Palmquist, Willard Dixon and Al Collier, engineers at Chicago, Kansas City and Los Angeles, respectively.

Harold Montee, office manager in New York, is an ex-CAA inspector. He founded his own flying school in Los Angeles as early as 1919, built and raced his own planes, was an early airline pilot. He was a senior inspector with the Government when he joined Aero Insurance. Patricia A. Thomas is one of the few rerated women instructors working on the CPTP. She recently left the employ of the company. Richard B. Role, former southern representative, is now on duty as a lieutenant senior grade in the U.S. Naval Air Reserve, and has 3,000 hours big boat time logged. Capt. G. R. Beck, manager of the branch office in Montreal, has more hours than anybody in the company. He flew for Britain during the first World War. At present he spends all his spare time instructing pilots for the RCAF under the Empire training plan.

Employees rate Aero Insurance as "tops" among insurance firms. At the home office tea is served every day at 3:30 o'clock. One girl said, "I shouldn't say anything to you, but I think you ought to know that this organization treats us swell. There's nobody here, as in many insurance concerns, standing over us with a whip. The executives consider us as persons, not cogs in a wheel, and the result is very high morale among the office workers."

General manager George L. Lloyd is one of the assets Aero Insurance took from Barber and Baldwin, for whom he was vice-president and manager. Lloyd flew as a flight commander in the RFC during the last war. He flew under fire after only 15 solo hours. His insurance background drew him inevitably into aviation insurance.

Fred N. Davey, production manager, is the supersalesman of the outfit. He smokes his cigarettes down to the last possible puff, douses them in an ashtray fashioned from an airplane. This and his "admiral's" commission from American Airlines are the only reminders in his office that his work has to do with aviation. Davey travels incessantly over the country, contacting agents, helping them to get out and sell.

He is fond of recalling that his company has insured many of the most famous airplanes in history. The *Spirit of St. Louis*, in which Lindbergh made his solo New York to Paris, carried Aero Insurance coverage when flying over land, but was not insured on the most dangerous portion of the voyage—from Botwood to Ireland. The huge DC-4, the 50-passenger plane in which Benny Howard toured the United States for exhibition flights, was protected by an Aero policy, as are the *Clippers* before entering scheduled airline service. One of the planes in which Richard Archbold explored inaccessible portions of Africa, was washed out in a freak storm. His Aero Insurance policy was a great consolation.

But those are isolated instances of large policies which Aero can't sell in great enough volume to be profitable. What interests them most are the thousands of private and commercial airplanes that throng America's airports. There's a huge market there for Aero's product, and they are going after it scientifically.

By a steady reduction of insurance rates and a campaign to acquaint pilots and owners with the advantages of owning insurance; by regular inspection of the equipment they insure to the benefit of the owners as well as themselves; by earnest application of the rules of safety, Aero Insurance Underwriters is making aircraft insurance as much of a "must" among owners and operators as automobile coverage is to car owners and drivers.

END

Women Wanted

(*Continued from page* 29)

in aviation. In reservations you need not know typing, shorthand, geology or Bach. Your only implements are a telephone, an Official Aviation Guide and telephone technique — which is, after all, nothing but a sense of courtesy and a desire to be helpful.

Selling over the telephone, like selling over the ticket counter, is elementary. The only prospects you have to sell are those interested enough in your product to come to you to ask about it. You have only to water the seed already planted. Of course, you won't be able even to do that unless you yourself — pardon the triteness, but it's true—are sold on flying as a practical means of travel.

Knowing your product means that you have a working knowledge of all United States airlines and where they go. You must be able to read timetables, work up air itineraries, compute rates and give glowing accounts of the scenic beauties of your particular route and the delight of riding in one of your planes. You'll have to know a little of the mechanics of flying, plane structure and the differences in the types of equipment used on various lines. But that comes with study after you have landed the job. Reservations work takes no previous experience and most of the requirements are learned by smart girls within two weeks after they answer their first telephone calls.

Before your first interview with the employment manager, study the Official Aviation Guide. Any ticket office can give you a back copy. It has a large map of the air routes, all the schedules and much miscellaneous information to work into your approach.

It takes considerably more learning to be a good ticket clerk. And while the homeliest girl in the world might work in reservations so long as she has a pleasant telephone voice, the woman ticket clerk has to be decorative as well

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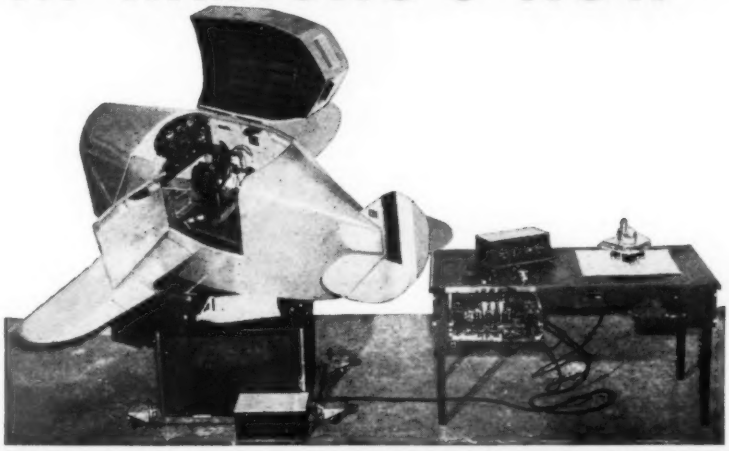

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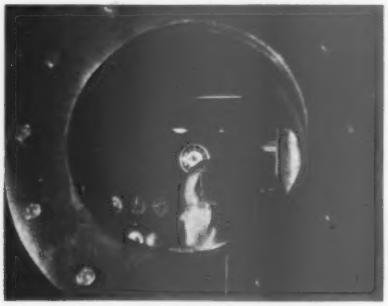

WHAT'S THE LIMIT?

A pilot's in a pressure tank. What atmospheres can he stand? How high will a plane go? How long will one last? Can the tip of a blind rivet be exploded so it mushrooms and holds its load? How can plastic be joined to metal? Read about the new Lockheed structures research laboratory which is designed to answer these and hundreds of other questions in the

APRIL ISSUE

FLYING

ON SALE AT ALL NEWSSTANDS MARCH 10

as utilitarian. Experience in a travel agency is the best passport into a job of this sort, but "retail sales work" listed in the experience column of the application form will make an employer look twice.

Here you are dealing with the public in person. Much of your work will be answering questions for people who don't fly and probably won't, but who have an undying curiosity. You must have a thorough grounding in all phases of air transportation. Ticketing itself is a subject with many ramifications, but you pay for your mistakes so you'll take care to be fastidious about using the right kind of tickets and charging the correct amount for them. Fortunately, most ticket agents are still men, and they'll come to your rescue until you catch on. You'll be called upon to check baggage, to calm down passengers with complaints and occasionally to refuse passage to drunks.

Incidentally, a year ago a woman ticket clerk was only a threat men conjectured with in New York. But if you'll visit the Airlines Terminal building across from Grand Central you'll find several behind nearly every ticket counter. Some lines are replacing their draftees both in reservations and at the counters exclusively with women. That's how well they've become entrenched within a few years.

At La Guardia Field, where the ticket counters are manned by operations personnel, women made their first appearance months ago, when American Airlines hired two as information counter clerks. TWA has had women in the same capacity at the Pittsburgh airport for over a year. The Consolidated Airlines ticket office at the Chicago municipal airport has followed suit.

Women are peculiarly suited for that work because of their patience with ignorant customers and idlers and their adeptness in looking up the answers. Information counter work is excellent training for better jobs of any sort and it appears that such work will open up in many of the 200 airline cities soon. So far women have made only small dents in the operations end of the business, but their advancement is entirely dependent upon their aims and industry.

Consider Joan Byles. She started some three years ago as a typist and has progressively taken over more responsibility, until she now does the work formerly performed by a dispatcher. Scheduling crews—pilots, first officers and hostesses—out on flights is a ticklish and highly complicated task. Pilots are not allowed to fly more than 85 hours a month; there also are limitations for hostesses. Joan's job is to assign them to flights so they get the proper rest, have days off and take flights out in rotation. Whenever planes are delayed or cancelled en route, the whole formula for scheduling is scrambled. Joan must improvise and never lose sight of the many regulations to which flight personnel must adhere. Probably the only indispensable woman in her company, she must be within reach of a telephone 24 hours a day.

Like most businesses, the airlines employ scores of telephone and teletype operators, typists, secretaries and general office workers. Unlike most concerns, the airlines present such employees with splendid opportunities for advancement both in status and in salary. Personnel work is so far a male monopoly in the airlines. But what's to prevent a trained woman from getting a job in the personnel department and working her way into an executive spot? The field's wide open. Secretaries to junior executives have a way of becoming priceless, because within a year they know so much about the intricate business that it is more economical to hand out raises than to try to train new girls.

In spite of Government restrictions on issuance of new airplanes to domestic airlines, business is booming as never before. The draft isn't sparing air transportation companies, yet employment figures are rising and personnel problems multiply. They hate to admit it, but airline men see the day coming when properly trained women will take over jobs as meteorologists, accountants and even passenger agents—who are the all-around trouble shooters.

And why not? Women have proved themselves in other branches of the industry. Ruth Haviland won recognition throughout the industry by her feats in promoting women into airplanes. Miss Haviland, by dint of her deep interest in flying and commercial aviation, talked her way into more jobs with an airline than most men ever hold. She has been, among other things, a station hostess, a passenger agent, a dispatch clerk, a reservations clerk and even a traffic representative. She now sells wives on the idea of letting their husbands fly with United Air Lines and is probably the highest ranking woman executive in the business.

For girls promotionally inclined, the publicity departments networking the land are a good bet. Airlines are a big source of news. They maintain large staffs to dispense it, as well as to carry out joint advertising campaigns and otherwise get newspaper and magazine credits. While there are few of the skirted sex holding down the main jobs, most of the assistant press agents are talented women. Newspaper, advertising or press agent experience is almost prerequisite, but the gal with ideas and stamina, as well as some writing talent, can ditch that requirement.

Working for an airline has unusual advantages. You can spend your vacations touring the land without saving for months in advance. Chances are you'll travel occasionally on business or just to see how the airline works (compliments of the management). In spite of air transportation's unbelievable growth within the past few years, we've just seen the beginning of it. Even if the Government is unable to lift its restrictions on new equipment and new routes, soon the momentum of all the new business will mean more flights, more money, more employees.

You're probably not interested in the men, but they are carefully selected and quite generally an unusually nice group of people. Mostly unmarried.

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Photographing THE ARMY *in Action*

That action-charged picture of army tanks roaring across country, or of warplanes in flight, may well have been shot by one of the army's own anonymous press photographers. Months before the actual war plunge, the War Department had undertaken for the first time in history to see that the public received a full story of the army's part in the defense effort by means of pictures as well as words. War has intensified the effort. By all means, don't fail to read how the army's public relations bureau has enlisted the aid of veteran press and newsreel cameramen to provide the nation with story-telling pictures of our war activities. See page 22 of the fact-filled

POPULAR Photography MARCH ISSUE

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On the debit side these factors may be important: Many offices are open 24 hours daily, which means you'll be expected to hold down the same tricks as the men, night work included. Airlines set great store by their personalized service and you'll be expected to stand a lot of abuse from passengers who believe themselves slighted. All airline work requires handling of innumerable details and if you don't have patience with these picayune annoyances, look for something more suitable.

It's a great business, always changing, always interesting. If you pick your objective and plan your attack well, there's no reason why you can't successfully storm the heights. It's being done every day.

END

Letters

(*Continued from page 6*)

Sirs:

. . . I read your publication on the U.S. Army Air Corps with very great interest and I know I will do the same from the Naval side. Both these publications have most valuable information contained therein.

F. W. Bowhill
Royal Air Force Ferry Command
British Air Ministry
Montreal Airport
Dorval, P. Que.

Sirs:

. . . I think your staff has done a wonderful job both in reporting and photography in presenting the part of aviation in the U. S. armed forces. I enjoyed reading . . . the Naval aviation issue . . . thoroughly and congratulate you upon its excellence.

Arthur Capper
Senator from Kansas
Washington, D. C.

Sirs:

. . . The . . . big Naval issue . . . will receive a special place in my library and it certainly will be of great value as a reference book on Naval aviation, which plays such an important role in the present World War.

J. E. Meijer Ranneft
Captain, R.N.N.
Naval Attache,
Royal Netherland Legation.
Washington, D. C.

Sirs:

. . . We have enjoyed this issue very much and consider it the exemplary bit of publishing. All of the articles on U. S. Naval air power are outstanding and are the best we have ever read.

It is our intention to keep this copy in our office as a reference book on Naval aviation and we believe that we will find it invaluable for this purpose.

H. M. White,
Airplane Division,
Aeronautics Dept.,
Goodyear Tire & Rubber Co., Inc.
Akron, O.

Sirs:

. . . Editorially and pictorially, it probably is the finest and most readable issue of an aircraft magazine I have ever seen and it is heartening to have a copy in such a permanent form.

William L. Wilson,
Director of Public Relations,
Republic Aviation Corp.
Farmingdale, Long Island, N. Y.

Sirs:

. . . The issue was patriotically conceived and well carried out—to produce a factual and comprehensive review of the scope and activities of that integral and indispensable part of the Navy which is included in the term "Naval Aviation".

E. J. King,
Admiral, U.S.N.
Office of the Commander in Chief.
Washington, D. C.

CAA Issue

Sirs:

. . . My heartiest congratulations on the special CAA issue . . It was not only a thorough presentation of the CAA and all its activities but also was very effective in its use of pictures and of type layouts.

You will understand that I speak not only for myself but the entire staff, all of whom have showered the issue with praise.

Donald H. Connolly
Brigadier General, U. S. Army
War Department
Washington, D. C.

● Recently Brigadier General Connolly, former Administrator of the Civil Aeronautics Administration was assigned as director of civil air activities for the War Department.—Ed.

Women

Sirs:

I keep thinking about that article in Flying by John R. Hoyt in which he asserts that the two worst features of women, as related to flying, are their tendency to cry when criticized and their lack of ability to act in emergencies.

. . . Women in aviation are going through the same struggles they've had in the past in other fields. Mainly the struggle against prejudice, and doubt that women can do a job equally well as a man or even competently. They are being criticized unfairly.

. . . I'm no veteran teacher, but I've been instructing women pilots since 1936 in Washington, New York, New Jersey, Pennsylvania, Virginia and at the Embry-Riddle landplane base in Miami and I've never had a cry baby student.

Women do—just as men—expect to be handled tactfully. No one likes harsh criticism and bawlings out. . . . Once or twice I have seen women cry under a verbal flogging. . . . I have seen the same . . . break a man's spirit.

. . . There is a difference, naturally, in the individual aptitudes of women, just as there are differences in men students. But the women who are going to make good pilots are not the weeping kind.

. . . All the women I've taught . . . were equal of men in emergencies. . . . I quite agree with Mr. Hoyt that women pilots cannot be trusted in instrument weather . . . because they have not had sufficient training. Airline and Army pi-

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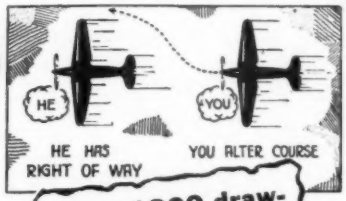

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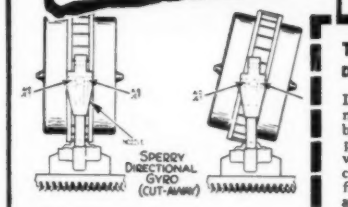

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END

America Poses

(*Continued from page 40*)

which must be taken into consideration. If ground positions are located before flights by triangulation or traverse, and are so numerous that several appear on each photograph, then the compilation of planimetric maps from aerial photographs is comparatively simple. This condition seldom exists, however, and in single lens aerial photographs such controls are usually from 50 to 100 photographs apart. The old methods of control spacing by triangulation, traverse or plane table, are expensive and extremely slow for our present urgent period of putting big jobs through in the shortest time possible. In some instances, such methods are completely unfeasible. However, to be of any real worth true centers of the photographs must be readily ascertained before a planimetric map is made. The erosion control work of the Soil Conservation Service calls for large scale (usually 1:15,840) planimetric maps of sections of country where existing control is generally sparse.

Charles W. Collier, formerly with Soil Conservation Service, invented the slotted template method to meet all ordinary requirements for planimetric maps made from aerial photographs. While no final standards of accuracy for aerial maps have been set up by the Federal Board of Surveys and Maps, a tentative standard has been set up which specifies that class A aerial maps must be of such accuracy that 90 per cent of all well-defined cultural and drainage features will be in correct horizontal co-ordinate position with 1/40 of an inch as the scale of publication. It was further decided that general purpose aerial maps should be planned for publication at 1:31,680, or a smaller scale.

The slotted-template method of controlling aerial maps is based on the principle that, provided aerial photographs are taken with the horizontal axes of the camera parallel to the ground, all angles radiating from the principal point of the photograph, through the image points as identified on the photograph, remain constant angles irrespective of scale change or relief.

In this method of applying desk control to maps made from aerial photographs, each picture of an area is reduced to a templet made of a stiff material not subject to distortion, on which picture points are represented by radial slots. Inserted close-fitting round studs permit sliding along the longitudinal axis of the slot to the desired position. A minimum of eight slots and a center hole appear on each templet, after which they are ready for assembly to make the planimetric map.

Aluminum in sheets 15 one-thousandths of an inch thick and 15 by 10 inches in size, riveted together, have been used satisfactorily as a medium upon which to lay the templates for etching and marking of the control positions identified on the aerial photographs. However, with the present need for aluminum some other material will probably be used for the grid. The largest aluminum planimetric map made by the Soil Conservation Service from aerial photographs was 25 by 35 feet, which covered an area of 4,400 square miles.

In making photographs for either planimetric or mosaic maps, only the best of flying conditions must prevail. Surprisingly enough, on an average for the entire United States, only two and one-half days each month can be utilized as perfect mapping days. In some localities, as many as six hours can be used for map making, but best results are obtained between the hours of 10 and 2:30. A single cloud in the sky will throw enough shadow on the surface of the earth to spoil an entire day or flight strip.

It costs the Government between three and five dollars to photograph one square mile of land. Flying at the usual mapping altitude of 13,000 feet above ground level, although heights of 20,000 feet are used under some conditions, it is possible to photograph a square mile of terrain on one film exposure. Doubling that altitude would permit four times the area to be included in one picture and might reduce the mapping costs. However, doubling altitude would require planes and equipment which are not ordinarily available for mapping purposes. In addition, when altitude is doubled the scale of the pictures is reduced one half, which means that valuable photographic detail is also reduced. Cameras with wide-angle lens would increase coverage at 13,000 feet with fewer photographs. Such coverage, however, brings about considerably more distortion at the edges and would, more than likely, require more overlap.

In map making, the advantage of aerial photography over line base maps lies in the showing of features which will allow mappers to keep in location. Of course, in aerial photography, the tilt of the plane and camera, lens distortion and displacement of the image cause errors to arise which cause deviations from actual distances or areas. It has been found, however, that if pictures conform to specifications, errors are generally slight. The Agricultural Adjustment Administration of the Department of Agriculture made a test to prove the value of aerial photography in land-use planning programs. A tract of 1,640 acres was measured from aerial photographs and then accurately surveyed with tape and transit. A comparison of the figures showed that the aerial photographs were but 3/10 of one per cent in error.

Aerial photographs and maps are in great demand by companies that lay pipe lines across the country. Large lumber companies use them in timber operations. In California, one large city uses aerial

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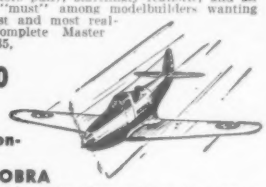

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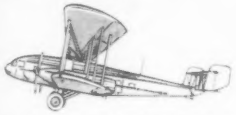

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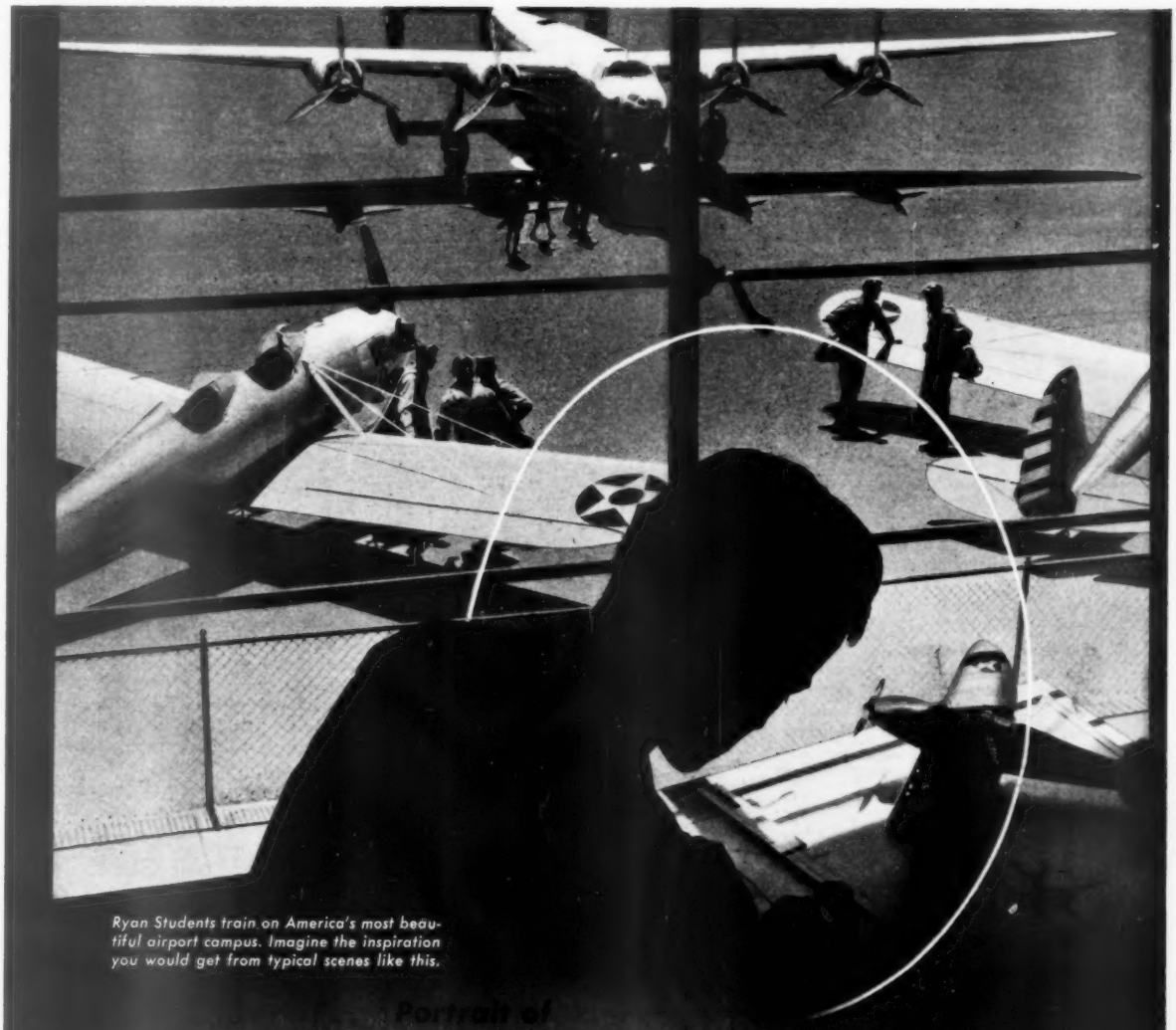

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maps extensively to determine the need for extension of public services and utilities.

The detailed picturization of areas presented by aerial maps causes them to be used in connection with many types of work far removed from aviation. A midwestern state even uses air maps to aid in the collection of taxes and for tax equalization studies. One of their mapping surveys showed that only 60 per cent of taxable lands in one county were on the records. Additional revenue in one year received from levying taxes on that land paid the cost of mapping from the air.

In aerial map making, it has been found that types of forests photograph differently. Deciduous trees have a different shade on maps than coniferous trees. Seasonal conditions, naturally, show marked changes. It is possible to make estimates of the number of trees of a particular kind in a forest with an air map. In one instance, in the New England states, such an estimate was based on the distinctive colorings of certain trees in the fall which gave their images in the photographs different shades.

Aerial mosaics and photographs have proved to be of great value in making drainage and water resources surveys and have been used extensively by many Government agencies. Pools, ponds, lakes and streams are clearly visible on air maps. Slopes and approximate drainage areas may be quickly identified and outlined.

Surface water varies in appearance on maps according to the time of day the map was made. At times it reflects darker than the surrounding area and at others it appears dead white.

Aerial maps are also used in hunting underground water supplies. Outcrops of water-bearing strata are shown clearly in air maps. If well depth and other pertinent information are obtained, dip and strike of the various strata may be calculated and prospective well sites determined. This phase of aerial mapping has become so popular that definite inroads have been made in the trade of the water diviner who, for years, has hunted underground water supplies with a willow branch held loosely in his right hand and a rabbit's foot clutched firmly in the left.

END

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Testing P-38

(*Continued from page* 54)

with a standard service-type parachute fully opened in the neighborhood of 35,000 feet would be at the rate of approximately 2,200 f.p.m.; at 20,000 feet, 16,000 f.p.m.; at 10,000 feet, 1,200 f.p.m., and so on down. In other words, from 35,000 to 20,000 feet, descent takes nine minutes, and death would most certainly intervene because of lack of oxygen. In the effort of climbing out of the cockpit and making a free drop from 35,000 to 10,000 feet—making a time allowance of about two minutes—the pilot would undoubtedly become unconscious while so doing unless equipped with an emergency cylinder of oxygen."

At altitudes above about 12,000 feet pilots slow up in mental calculation, reaction time, capacity to receive and interpret signals. At from 15,000 to 20,000 feet, without oxygen, a pilot's actual capacity to handle the airplane is lost, and because he is close to his "ceiling", any sudden change of direction which would cause the drawing of blood away from the head is likely to lead to unconsciousness without warning. Chronic anoxia results from continued exposure to high altitudes without oxygen, causing definite, sometimes permanent harm to the central nervous system.

What about the effect of all this on the P-38 pilots? They're probably in the best physical condition of any airmen in the world. Dr. F. E. Poole, Lockheed medical director, goes over them every 90 days, if not oftener. And the examination, which coverts every bodily function, lasts two days.

The men are up and down several times a day when they are on duty. They are busy improving the P-38—or the *Lightning*—as the British model is known. Big, blond "Swede" Parker has been handling the *Lightning*. As both the P-38's and the pilots are guinea pigs, the pilots have made some odd discoveries:

"It goes so fast," Parker reports, "that no de-icers will ever be needed at any altitude under any weather condition. The friction of the air over the wings generates enough heat to bring the temperature up from 15 to 20°.

He adds:

"The noise of the wind at high speed is terriffic. It's like a million bullets going by."

The procedure in acquainting the pilots with the P-38 is unique in flying annals. The Army flew the first one, known as the "XP". Then the job of testing was turned back to Lockheed. Calm, cautious and silent Marshall Headle flew the "YP" for the first time.

"The secret of flying a job like that," W. Currey Sanders, assistant chief test pilot at Lockheed, declares, "is in knowing it from the ground up. Headle watched it from the time it first went on paper. He was like an anxious father watching a growing child. When the plane was finally ready to fly he knew everything that had gone into it. He is a veteran flyer. He knows the ship's limitations as well as his own, and he was taking no chances.

"He flew the job for the first time at six o'clock in the morning. It was a great moment. Half of Lockheed was at the air terminal to watch him. He climbed in, ran up the motors, taxied her to get the feel of the tricycle undercarriage and the brakes. Then he took off. He flew it for about an hour."

Yes, Headle had studied everything from propeller and motor performance charts to the fuel system. And, while Headle from this time on flew the ship daily, Burcham was making his study of mechanism. Headle passed on everything he learned about performance to Burcham. Then, one day, Burcham took it off. Burcham coached Parker on flying the *Lightning*, Virden then took over the testing of the first American production model.

Then, using two-way radios, knee pads and slow motion cameras which click off photographs of the instrument panels every 15 seconds, they settled down to the job of improving and refining the slick job. The engineering department was flooded with performance reports. Gradually, as the production line began to flow, they "broke in" pilot after pilot, just as they had been "broken in". These pilots are running routine

(*Continued on page* 111)

Modify Air Cadet Test

AGE limit restrictions and educational requirements for the Air Corps aviation cadet training program have been changed for the duration of the war, it was announced by the War Department January 15. Under the new regulations men between the ages of 18 and 26 inclusive will be eligible for the cadet training courses.

The previously existing rigid education restrictions have been waived, and college education no longer is a requirement for enlistment in this branch of the service. Candidates, however, will be required to pass a "screening test," designed to establish the intelligence of the candidate and his ability to absorb the rigid training.

Physical requirements have likewise been modified, except for visual acuity, which remains unchanged.

The revised requirements will make aviation cadet training available to many thousands previously excluded because of educational and physical deficiencies. Included in the cadet program are courses in special schools covering training as bombardier, navigator, pilot, armament, communication, engineering, meteorology and photography.

During their training period, cadets are paid $75 monthly, to which certain subsistence allowances are added. Upon being commissioned as second lieutenants in the Air Corps their pay may go as high as $245 per month, with a bonus of $500 for each year of continuous service.

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FIGHTERS AND DIVE BOMBERS

U. S. Buffalo Planes Are Making Good Account of Selves

U. S. Fighter Gets First Jap At Singapore

BY DOUGLAS WILKIE

Released by North American Newspaper Alliance to The Dayton Daily News

SINGAPORE, Jan. 12.—(By Wireless)—The first Japanese bomber positively shot down by a fighter in the neighborhood of Singapore was sent hurtling to earth soon after dawn yesterday by two New Zealand sergeant pilots in an American-built Brewster Buffalo.

The New Zealande-

U. S. Fighter Plane Use In Far East Acclaime

British Magazine 'Flight' Cit Buffalo's Maneuverability

From the Herald Tribune Bureau

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LONDON, Jan. 1.—American-b fighter planes, the Brewster Buff in action in the Far East, rece high praise for their maneuverab

Buffalo Craft Pilot on Reconnaissance Flight Eludes Two Formations of Enemy Messerschmidts in Thailand Encounter

FIGHTER PROVES MERIT IN AIR

WASHINGTON, Dec.

(*Continued from page* 108)

tests on the production models. There now are more than a dozen production model tests pilots flying the P-38's as they come off the line for delivery to the United States and British air forces.

Parker and Burcham were the first Lockheed aces. [Virden recently died in an accident.—Ed.] Their job is not to test production but to offer themselves and their ships on the altar of aviation progress. They have many thousands of hours of all kinds of flying behind them, and each has flown every Lockheed model designed during recent years. They look on their work as a business, have no notions about "heroics".

Burcham, native of Newcastle, Ind., now is 38 years old and has 4,200 hours of flying to his credit. After being educated at Newcastle High School he came to Los Angeles with his parents, attended Whittier College. He soloed in 1929 at Fullerton, Calif., and began a career of stunt flying which made his famous. He joined Lockheed in 1937. He is married, has two sons.

Parker, a skyscraper, was born in Dover, Mass., December 14, 1907, which makes him 34. He attended St. Marks Preparatory and put in two years at Harvard before the Harvard Flying Club and flying got him away from his books. He soloed in 1929, has 7,000 hours. He did charter work with Skyways, Inc., at Boston, handled a Monocoupe agency in Arizona, later tested the Luscombe *Phanton* prototypes at Kansas City with Pete Brooks. His two big thrills are a spin bailout and being sealed into a P-38 to fly monoxide tests. He's six feet, two and one-half inches tall, and weighs 225 pounds. He joined Lockheed in September, 1937.

Parker adds a couple of final "don'ts" to high altitude flying in the P-38. "Don't" he says, "let anything get you excited or nervous when you're at better than 30,000 feet. You'll tire so fast you won't believe it."

The testing of the P-38 probably will continue as long as the plane is in production. The high altitude testing is destined to go even higher, speeds will be even greater. The pilots not only fly their charges constantly, seeking new data, reaching for improvements, but they themselves are being studied and written about constantly by physicians, research workers and newspapermen. Not infrequent are their trips to the huge sealed altitude chamber in the Lockheed Products Research Laboratory, where they climb in and subject themselves to conditions of pressure found at 40,000 feet and temperatures as low as —70°.

"The time is coming," Parker predicts, "when we're going a lot higher and where it will be a lot colder than that."

Yes, it goes on all day. It's hard to find these pilots together in the elaborately equipped new Lockheed pilot house, a converted private home amid oak and pepper trees just north of the Lockheed Air Terminal. One, two or all are flying constantly. There are high speed tests, cooling tests, rate of climb tests, hydraulic functional tests, dive tests, instrument tests among others. They have to find out such things as how much pressure there is against the nose wheel door at what speed and the force required to open it; how fast they can lower the wheels, how fast they can retract them and a thousand other things. Engineering, naturally, is always coming out with a new idea, asking if it's workable, what it does to the plane and how and why.

"And," says Sanders, with a confident grin, "the boys find out."

END

AOPA News

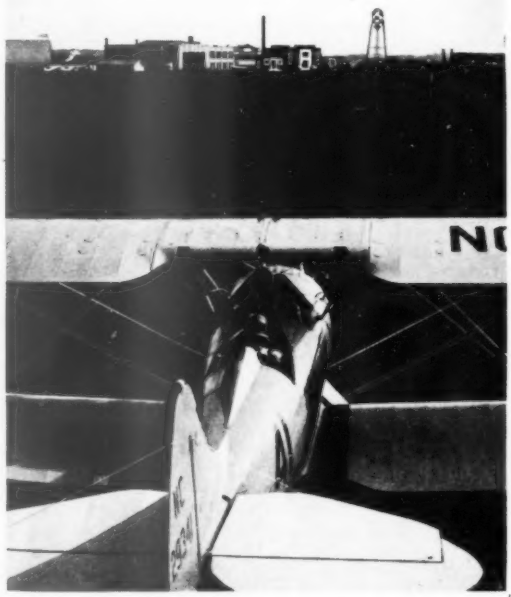
(*Continued from page* 47)

regular police officers which might prove difficult in many areas.

Civil Air Patrol

For over two years (ever since the inauguration of the AOPA AIR GUARD), this organization has favored a form of semi-military training program for civilian pilots to prepare them for non-combatant work with the armed forces and to increase their skill and proficiency as pilots (many thereby becoming eligible for training for combat duties). The Civil Air Patrol is essentially the sort of plan we desire to see in action and AOPA pilots will recognize in the CAP much of the work of the AOPA staff.

As with all things now, it is necessary



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to revise, change and run the "bugs" out of the CAP. AOPA feels that there are several features of CAP which need the attention of officials in charge. At the same time we urge pilots to be cooperative and patient. The CAP was born under conditions of great stress and any fair-minded person should be constructive in his criticisms. CAP will need good manpower. Some of the kickers would fill in some of the gaps. CAP officials should take into consideration the advice and counsel—and the legitimate complaints coming in from the field.

Mis-use of CAP

More than a few complaints have filtered into the AOPA office about individuals who have used the CAP set-up for personal gain and to the business disadvantage of many competitive operators and pilots. This sort of thing must be stopped—and very quickly by CAP officials. The offending members should be stripped of their positions of authority. It is only in this way that CAP will maintain the respect and support of civil pilots . . . and pilots *must* support the CAP endeavor.

Any CAP leader who abuses the privileges granted him as a leader or who takes unfair advantage of the rank assigned should be removed. This must be administered in an orderly manner and through the proper channels.

Everybody Can't Be Boss

On the other hand, a great many letters, telegrams and long-distance calls have been received by AOPA from persons registering personal grievances about the CAP. This also must not be tolerated. No matter what system or what personnel could be chosen for a function such as this there will always be a few unintentional injustices . . . and a great many disappointed people: "jilted," they might call themselves. Harmony and cooperation are the two requirements of success for the CAP. Personal feelings have no place in this picture. Everybody can't be boss.

Most of the people in responsible positions in the CAP are doing their best to put the job over. They deserve and should receive the support of their fellow pilots. Don't kick unless you have something better to offer. Get behind the effort and give it your best. There is a job for every pilot to do. Disunity will only spell disaster.

The AOPA offices are helping to effect a sound organization within the CAP.

Regarding State Organizations

In addition to the CAP there are several organizations within individual states dealing with the training of pilots. In most cases these take the form of Air Corps Branches to the State Guard (or Militia). Members of these organizations are serving the need of the State in much the same manner as members of the CAP are serving Federal civilian defense. Among those States who have active organizations in connection with their State military forces are: The Air Corps, California State Guard; The Aviation Branch, Texas Defense Guard; Illinois Reserve Militia Air Corps. Colorado and other states also have similar units. In each case pilots up for an enlistment period are subject to call to active duty by the governor of the State (through the adjutant general) in the cases requiring the establishment of martial law or the protection of life and property within that State.

These State groups are limited in number and usually restrict pilot membership to aircraft owners. It is believed that the CAP and the State groups will work in close harmony and that each will work with the other so that there will be no overlapping of work and also so that each can act as a "reserve" for the other in the event of a major call.

License Re-instatement

In spite of many special letters and bulletins sent by the AOPA office to augment the CAA service there still seems to be some confusion regarding the procedure for pilots to get back into the air. A license which has been indorsed by an inspector after personal interview and presentation of a birth certificate and letters of recommendation is not sufficient and *a pilot so reinstated can not fly* unless he has also on his person a new CAA identification card with photograph and fingerprints a part thereof.

For pilots who have "gone through the mill" the first time for certificate endorsement, it is necessary that they again contact their inspector, taking with them 2 photographs showing full face (and shoulders), size 2½ x 2½. They must also take back their letters of recommendation and birth certificate. The CAA inspector will keep one of the photographs and attach it to the fingerprint card for file in the FBI in Washington. The other photograph will be affixed to the personal identification card which all pilots were required to carry on their person after January 8th, 1942.

If there is any question regarding the procedure contact your nearest CAA representative or AOPA member. Since this AOPA News column is being written in advance of publishing date it is possible that the foregoing may be out-of-date before it reaches pilots' hands. AOPA members are urged to read the AOPA Section which goes to press only 10 days before it reaches members' hands.

AOPA Jackets

The AOPA jacket with AOPA wing insignia are still available as long as the supply lasts. We call attention to the fact that it was necessary to raise the cost of this jacket several months ago 50 cents so that it now sells for $5.50. Interested pilots should write the National Service Office for a measurement and order blank. Because the jacket bears the AOPA pilots insignia, only registered AOPA pilots may purchase them.

AOPA Units

AOPA Units have been doing yeoman service in the matter of fingerprinting and license reinstatement. Units have assisted the CAA in the tremendous job of getting pilots back into the air. If any non-members desire help we suggest that they contact their local AOPA unit. If in doubt of their address write AOPA, Transportation Building, Chicago, for details. They will be glad to help you and tell you about AOPA's service to pilots.

END

Plane Planters

(*Continued from page 49*)

Sheep and cattle are still grazing during these months. Their movements and the fall winds serve to cover the seeds sufficiently well for them to winter and germinate.

The rancher's only duty in these operations is, when notified of the seeding date, to mix seed in the desired proportions and deliver it to the central base from which flights are made. He must also mark the area he wants covered with strips of paper or other objects easily seen by the pilot from the air. It requires only one and a half minutes actual flying to release 500 pounds of seed with the three-inch vent at the half-way mark.

County agents and ranchers in Oregon, who have seen the results of these seed flights are of the enthusiastic opinion that better grass crops are obtained than can be produced by the old method of hand seeding. Grass stands are uniform and the spottiness which results from hand work is entirely missing. It requires only a few experimental flights before a pilot is able to perform planting operations successfully. Seeding by airplane, however, does entail familiarity with the surrounding country. A good seed pilot must handle his airplane as dexterously as a jack rabbit handles his legs, and with about the same amount of hopping and jumping.

In California, particularly in the Los Angeles area, there have been miles of land burned over in recent years. The Forest Service has now sown mustard seed in that section as a control measure for the floods which follow in the wake of denuded land.

It has been estimated that floods in California are more costly per square mile of population than in any other part of the world. These floods are the direct result of the extensive and unprecedented number of fires which have burned over the sides of hills and canyons. Scrub in the canyons is particularly inflammable during the dry season and burns with such intensity that humus and organic matter are burned from the soil, leaving only a dry, slake-like crust. When torrential rains fall, and sometimes the entire year's precipitation of 15 or 20 inches falls at one time, this crust slides away and retains none of the water. Rich communities and ranches built up at the mouths of the canyons are completely inundated and washed away. Losses from such conditions run into millions of dollars each year.

The Forest Service, realizing that vegetative root growth is the only means of preventing flood disaster from rolling out of the canyons, has selected mustard seed for aerial sowing over the burnt areas. In addition to the low cost of such seed, it sends out vigorous root systems quickly. Other experiments were made with mill-wheat and sunflower seed, but nothing has equalled mustard. Methods of sowing are the same as used in the Oregon and Squaw Creek Hills country.

END

I Learned About . . .

(*Continued from page 58*)

complimentary things. I should have turned my scorn inward. Only 40 miles! I had already flown that in circles and was no better off. All I knew was that I was slowly but surely drowning in mid-air somewhere between Wurtsboro and Christie—but where? On a little 30-minute hop I had become a very lost aviator.

By taking a brutal face lashing, I could just peek over the side. A village slipped past beneath. I circled it for what seemed like an hour trying to identify it on the map. Actually it was closer to five minutes, but I was busier than the proverbial paperhanger. I finally managed to tie the throttle in position with my handkerchief—that was quite a performance too—but not in cruising position. It just wouldn't stay there. It held just enough revs to keep me from stalling in level flight. The slightest climb and off we'd go in the start of a low power spin. I hated to look at the airspeed.

The map, despite its government durability, was now a wet mess resembling oatmeal and just about as easy to handle. I finally managed a really good look at it with my stinging eyes and identified the town. I was a good 30 miles off course. I had two alternatives. There was a little field near the town that didn't look too terrible. It was the first I had seen worth considering. I could attempt a landing

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in it, or set a course for Christie airport. Now that I'm older and wiser, I would have landed and fixed the throttle. As it was, I elected to carry on to Christie.

By the time I had a new course figured out I was involuntarily hedge-hopping again—banging through the rain at a near stall. I was mad and I was scared, and I was kicking myself in the pants—all at the same time.

The only right thing I did was to hold that course once I had set it, through high and low water. I got an occasional bleary glimpse of a lot of strange country. I looked up at the top of a few hills as they marched past in clammy procession, but I practically ran into Christie airport. I landed and poured myself out of the Waco. As my feet squeegeed across the grass to the hangar, they mocked every excuse I could think up.

Forty miles, I thought, may be only 40 miles—but they grow long or short, as the case may be. An airplane is the fastest method of transport, but give it time before you start. A few minutes saved scurrying around on the ground, or refusing to be delayed, can turn into embarrassing air hours without half trying.

END

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War In Stratosphere . . .

(Continued from page 38)

or a volley of explanations. He possesses that disarming characteristic of small boys with whom it is impossible to be angry for long in spite of sometimes exasperating behavior. Once you have met him you never forget him, but think of him in terms of warm affection."

It was difficult to appreciate the extraordinary engineering involved in the turbosupercharger. The turbine revolved at 20,000 or more r.p.m. from the pressure of exhaust fumes at 1,500 degrees, Fahrenheit. Manifolds and turbine buckets were red hot while on the same drive shaft, only a few inches away, the compressor handled atmosphere as low as 76 degrees below zero. At 22,000 r.p.m. in a circle less than a foot in diameter, and weighing less than one hundredth of a pound, one of the tiny buckets was subjected to a centrifugal pull of around 1,750 pounds.

There was a much prompter welcome for Dr. Moss's geared superchargers which first began to attract attention around 1926. Advances in metals and manufacturing processes by that time had produced materials capable of withstanding the great stresses involved in this type of mechanical arrangement. A geared supercharger is a small centrifugal compressor, usually weighing four pounds or less, which is built into an airplane engine and which obtains its power by gears from the engine crankshaft. Gears range in ratio as high as 14 to 1 and with an engine speed of 2,000 r.p.m., the impeller turns at 28,000 r.p.m.

While the geared supercharger did not hold the high altitude possibilities of the turbo type, it could take a plane up to 15,000 feet or so and was particularly efficient at the precise level for which it was geared. It was soon evident that it was a great advance over everything earlier in the commercial field and manufacturer to manufacturer redesigned his engines in accordance with Dr. Moss's ideas and his company, a pioneer in the making of turbines of all kinds, supplied the high impellers to all.

Some three-fourths of the engines made in 1929 had geared superchargers, and their use increased steadily until they became virtually standard equipment. Until 1938 all were from Moss designs and possibly 95 per cent of those made today are his types. The Air Corps, operating under depression budgets, found some money for turbosuperchargers, but Dr. Moss on January 1, 1938, went into what he thought would be retirement without having all his dreams for these realized.

In retirement, Dr. Moss began to devote himself to his numerous hobbies. One of these was searching for fragments of the wall that the Romans built around London about 120 A. D. He had listed 30 of these, including several not in guidebooks, and was in London working on the project the day the Munich pact was signed. The sequence of events unleashed by this took Dr. Moss out of

(Continued on page 121)

FLYING'S USED PLANE LISTING OF AUTHORIZED AIRCRAFT DEALERS

The world's largest selection of used aircraft is listed in this special reader service section. Fine used airplanes in good licensed condition, some with hardly any time at all, many with but a few hours since overhaul. Each plane selected by an expert who has the mark of factory approval due to the fact he is an AUTHORIZED AIRCRAFT DEALER. These are ships you can buy to fly. Select any one of them, they are all real buys, and can be purchased just as you purchase your car.

ALL AIRCRAFT LISTED ARE LICENSED

DEALERS	MODEL AND ENGINE	TIME	TIME SINCE OVERHAUL	PRICE
AERONCA				
United Aero Corporation, P. O. Box 222, San Antonio, Texas	Cont. 65	150 hr.	Never	$1925
Cedar Rapids Airways, Inc., Box 183, Cedar Rapids, Iowa	Chief Lyc. 65	360 hr.	Never	1895
Ashcraft Bros. Flying Service, Municipal Airport, Lawrence, Kansas	Chief Cont. 65	500 hr.	Never	1650
Mountain States Aviation, Inc., 3800 Dahlia, Denver, Colorado	Chief Cont. 65	320 hr.	None	1650
Morristown Fly. Club, Morristown, Tenn.	Chief '40 Lyc. 65	362 hr.	No	1375
Northern Air Service, Grand Rapids, Mich.	LB Ken Royce 90	550 hr.	100 hr.	1350
Lane Air Service, Albany, Ga.	Chief Deluxe Cont. 65	375 hr.	Recently	1300
Inter-City Avia. Inc., Boston Munic. Arpt., E. Boston, Mass.	Chief Lyc. 65	825 hr.	210 hr.	1250
Pierce Flying Service, Box 894, Eureka, Calif.	Chief Cont. 65	2038 hr.	49 hr.	1250
Jacksonville Air Service, 33 East Second St., Jacksonville, Fla.	Chief Cont. 65	400 hr.	Just	1200
Tred Avon Flying Service, Easton, Maryland	Trainer Frnklin. 65	397 hr.	Never	1195
St. Louis Flying Serv., Lambert Field, Robertson, Mo.	KCA Cont. 50		Recently	1175
Pierce Flying Service, Box 894, Eureka, Calif.	Trainer Cont. 65	1024 hr.	366 hr.	1150
Jenkins Air Serv., Munic. Arpt., Rochester, N. Y.	Trainer Lyc. 65	550 hr.	50 hr.	1150
Blvd. Arpt., Inc., Roosevelt Blvd., Phila., Pa.	TL Lyc. 65	150 hr.	No	1150
Jenkins Air Serv., Inc., Munic. Arpt., Rochester, N. Y.	TL Lyc. 65	200 hr.		1150
Springfield Avia. Co., Munic. Arpt., Springfield, Illinois	Tandem Tr. Frnklin. 60	303 hr.	No	1150
Tred Avon Flying Service, Easton, Maryland	Trainer Lyc. 55	403 hr.	Never	1145
Evan Holtzman, Royal Airport, Madison, Wisc.	TL Lyc. 65 dual	419 hr.	39 hr.	1100
Art Whitaker, Swan Island Arpt., Portland, Oregon	Trainer Lyc. 65	700 hr.	500 hr.	1075
Northern Air Service, Grand Rapids, Michigan	C65 Cont. 65	1300 hr.	231 hr.	1075
Northern Air Service, Grand Rapids Service, Grand Rapids Airport, Grand Rapids, Michigan	TL Lyc. 65	800 hr.	200 hr.	1075
Dakota Aviation Company, W. W. Howes, Municipal Airport, Huron, S. Dak.	C-50 Cont. 50	650 hr.	Top	1050
Evan Holtzman, Royal Airport, Madison, Wisc.	T Lyc. 65 dual	423 hr.	33 hr.	995
Dakota Aviation Company, W. W. Howes, Municipal Airport, Huron, S. Dak.	LA Lyc. 50	1650 hr.	220 hr.	975
Tred Avon Flying Service, Easton, Maryland	Trainer Lyc. 50	532 hr.	Just	960
Cedar Rapids Airways, Inc., Cedar Rapids, Ia	Trainer Lyc. 65	1222 hr.	Just	950
Leeward Aviation, Vandergrift Airport, New Lansington, Pa.	Trainer Frnklin. 60	450 hr.	None	950
Lenhart Flying Serv., Arpt., Marion, Ind.	TF Frnklin. 60	365 hr.	310 hr.	950
Midwest Flyers, Lakeside Arpt., E. St. Louis, Ill.	Trainer Frnklin. 50	550 hr.	Jan. '41	950
R. D. Finefrock, Box 301, Tyler, Texas	Chief '38 Cont. 50	500 hr.	Just recl.	950
Albert E. Padags, Tri-City Airport, Wisconsin Rapids, Wis.	Chief Cont. 65	1270 hr.	27 hr.	900
Roy R. Taylor, Meacham Field, Fort Worth, Texas	Trainer Cont. 65	500 hr.	50 hr.	900
United Aero Corporation, P. O. Box 222, San Antonio, Texas	60TF Frnklin. 60	1594 hr.	Just	900
Southern Arwys. Sales Co., Munic. Arpt., Birmingham, Ala.	'38 Cont. 50	300 hr.	290 hr.	900
Aero-Ways, Inc., Municipal Airport, Cleveland, Ohio	Trainer TL Lyc. 65	456 hr.		895
Cedar Rapids Airways, Inc., Box 183, Cedar Rapids, Iowa	Trainer Frnklin. 60	850 hr.	Just	800
Portland Flying Serv., Inc., Municipal Airport, Portland, Maine	Chief Seaplane			700
Howard G. Mayes, Box 2104, Huntington, West Va.	Trainer Cont. 50	1089 hr.	208 hr.	700
Cedar Rapids Airways, Inc., Box 183, Cedar Rapids, Iowa	K Cont. 40	325 hr.	Just	650
Aircraft Assoc., Inc., Munic. Arpt., Long Beach, Calif.	K Aeronca 40	837 hr.	59 hr. since	600
Aero-Ways, Inc., Municipal Airport, Cleveland, Ohio	K	381 hr.		595
Pierce Flying Service, Box 894, Eureka, Calif.	C3 Aero 36	1452 hr.	43 hr.	550
A. F. Schachterle, Perkiomen Valley Airport, Collegeville, Pa.	K Aero 40	190 hr.	6 hr.	525
Howard G. Mayes, Box 2104, Huntington, West Va.	C2 Aero 40	202 hr.	8 hr	500

DEALERS	MODEL AND ENGINE	TIME	TIME SINCE OVERHAUL	PRICE
AMERICAN EAGLE				
John Ruzicka, Circus City Airport, Peru, Indiana	Kinner 100	330 hr.	30 hr.	$600
BEECHCRAFT				
DuBois Aviation Association, Municipal Airport, DuBois, Pa.	B-17-L Jacobs 225	293 hr.	Just	4250
Marion Parkinson, Estherville, Iowa	B-17-L Jacobs 225	879 hr.	25 hr.	3600
BUHL				
Aircraft Sales of Michigan, Municipal Airport, Detroit, Michigan	Wright J-6-9 330	1100 hr.	Just	1650
CESSNA				
Richard F. Holliaday, Box 147, Fredericksburg, Va.	Warner 165	150 hr.		8000
CULVER				
Alabama Air Service, Auburn-Opelika Airport, Auburn, Alabama	Cadet Frnklin. 80	110 hr.	Never	2500
Gaare Aviation Corp., 1285 Cleveland Avenue N, St. Paul, Minnesota	LFA Frnklin. 80	41 hr.	Never	1995
CURTISS ROBIN				
Safair, Inc., Roosevelt Field, Mineola, New York	Chall. 185	1456 hr.	20 hr.	750
Red Bank Airport, Inc., Red Bank, N. J.	Chall. 185	575 hr.	162 hr.	650
DAVIS				
Capt. Arthur J. Davis, 1108 Civic Opera Building, Chicago, Ill.	Warner 125	137 hr.	None	900
ERCOUPE				
Sioux Skyways, Municipal Airport, Sioux Falls, S. Dak.	Cont. 65	160 hr.		2450
FAIRCHILD				
W. Arnet Speer, 2830 Pacific, San Diego, Calif.	F45 Wright 320	500 hr.	25 since major	10000
Piedmont Aviation, Inc., Municipal Airport, Winston-Salem, N. C.	24 Warner 145	162 hr.	None	6985
Hyannis Airport Corp., Box 592, Hyannis, Mass.	24 Warner 145	510 hr.	70 hr.	6000
Thomas Metcalf, Toledo Mun. Arpt., Toledo, O.	24 Warner 145	356 hr.	Topped 306 hr.	3975
T. A. Colbertson, Medford, Oregon	246 Warner 145	800 hr.	350 hr.	3500
P. J. Sones Co., Haines City, Fla.	Deluxe Warner 145	890 hr.	190 hr.	3250
Susquehanna Air Service, 439 Broad Street, Montourville, Pa.	24 Ranger 145	850 hr.	180 hr.	2950
Cutter-Carr Flying Service, West Mesa Airport, Albuquerque, N. M.	24 Warner 145	900 hr.	100 hr.	2500
E. H. Brockenbrough, Munic. Arpt., Charlotte, N. C.	24 Warner 145	350 hr.	Just	2395
John P. Hall, West Haven Arpt., West Haven, Conn.	24 Warner 145	348 hr.	Recently	1650
Cutter-Carr Flying Service, West Mesa Airport, Albuquerque, N. M.	24 Warner 125	848 hr.	645 hr.	1400
Art Whitaker, Box 3820, Portland, Ore.	24 Cirrus 100	1200 hr.	None since Major	1125
FLEET				
Mount Hawley Flying Service, Box 626, Peoria, Ill.	8 Kinner b5	1622 hr.	None	1675
White Fly. Serv., Inc., Caldwell-Wright Arpt., Caldwell, N. J.	Warner 125	1090 hr.	6/40	1095
St. Louis Flying Service, Lambert Field, Robertson, Mo.	Warner 125	801 hr.	50 hr.	695

FLYING'S USED PLANE LISTING OF

DEALERS	MODEL AND ENGINE		TIME	TIME SINCE OVER-HAUL	PRICE
FUNK					
Island Crop Dusting Co., Airport, Caribou, Me.	75B		150 hr.	at 130 hr.	$1300
Aero-Ways, Inc., Municipal Airport, Cleveland, Ohio			290 hr.		795
HOWARD					
Des Moines-Flying Service, Inc., Municipal Airport, Des Moines, Iowa	DGA-18	Warner 125	1100 hr.	Just	4500
KARI-KEEN					
Dakota Aviation Co., W. W. Howes, Municipal Airport, Huron, S. Dak.		Lambert 90	493 hr.	146 hr.	650
KITTY HAWK					
John P. Hall, West Haven Airport, West Haven, Conn.	8-5	Kinner 125	1825 hr.	30 hr.	1250
LAIRD					
Paris Flying Service, Municipal Airport, Paris, Texas	LC1B	J-5 220	800 hr.	275 hr.	895
LUSCOMBE					
Aircraft Unlimited, Inc., Roosevelt Field, Mineola, N. Y.	8D-1	Cont. 75	50 hr.	Never	2900
Aircraft Unlimited, Inc., Roosevelt Field, Mineola, N. Y.	8C-1	Cont. 75	120 hr.	Never	2600
Aircraft Unlimited, Roosevelt Field, Mineola, L. I., N. Y.	8C1	Cont. 75	120 hr.	Never	2500
Albert E. Padags, Tri-City Airport, Wisconsin Rapids, Wisconsin	8C	Cont. 75	460 hr.	32 hr.	2150
C. W. Peterson, Municipal Airport, Salina, Kansas	8A	Cont. 65	125 hr.	Never	1995
Air Serv. Inc., Mun. Arpt., Denver, Colo.	8A	Cont. 65	84 hr.		1850
Midwest Fly. Serv., La Grange, Ill.	8A	Cont. 65 Dual	125 hr.	None	1850
W. F. Luke, Schenectady County Arpt., Schenectady, N. Y.	8A	Cont. 65	113 hr.		1800
Aircraft Unlimited, Inc., Roosevelt Field, Mineola, N. Y.	8B-1	Lyc. 65	80 hr.	Never	1800
W. F. Luke, Schenectady County Arpt., Schenectady, N. Y.	8A	Cont. 65	350 hr.	50 hr.	1550
Massey and Ransom Flying Serv., Inc., P.O. Box 416, Ft. Collins, Colo.	8A	Cont. 65	1139 hr.	175 hr.	1495
E. H. Brockenbrough, Airport, Charlotte, N. C.		Cont.	225 hr.	None	1200
Albert E. Padags, Tri-City Airport, Wisconsin Rapid, Wisconsin	8A	Cont. 65	580 hr.	175 hr.	1200
MEYERS					
Lynchburg Air Transport & Sales Corp., Preston Glenn Airport, Lynchburg, Va.	OTW	Warner 125	475 hr.	Just	4000
NEW STANDARD					
Boulevard Arpt., Inc., Roosevelt Boulevard, Philadelphia, Pa.		Kinner 90	1500 hr.	700 hr.	700
PIPER CUB					
E. H. Brockenbrough, Mun. Arpt., Charlotte, N. C.	J4	Cont. 65 '40	70 hr.	None	2200
W. Arnet Speer, 2830 Pacific San Diego, Calif.	Cruiser	Cont. 75	286 hr.	Never	2850
E. P. Jacoby, Sterling Airport, Sterling, Ill.	Cruiser J5A	Cont. 75	20 hr.	Never	2200
John Ruizcka, Circus City Airport, Peru, Ind.	Cruiser	Cont. 75	24 hr.	None	2000
Pierce Flying Service, Inc., Municipal Airport, Ft. Wayne, Ind.		Cont. 75	181 hr.	Never	1965
Pierce Flying Service, Municipal Airport, Ft. Wayne, Ind.	J5	Cont. 75	198 hr.	Never	1950
Stiles Motor Co., 260 Main St., Northport, N.Y.	Coupe J4A	Cont. 65	142 hr.	New	1900
Piedmont Aviation, Municipal Airport, Winston-Salem, N. C.	Coupe	Cont. 65	86 hr.	None	1885
Piedmont Aviation, Inc., P.O. Box 1941, Winston-Salem, N. C.	Coupe	Cont. 65-Dual	46 hr.	Never	1885
L. L. Rupert, Box 446, Muskogee, Okla.	Coupe '40	Cont. 65-Dual	155 hr.		1850
McBoyle Cub Sales, Airport, Lake Delton, Wis.	Cruiser	Lyc. 75	61 hr.	New	1845
Marlboro Airport, Inc., Farm Road, Marlboro, Mass.	Cruiser J-5	Cont. 75	196 hr.	Never	1800
Elliott Flying Service, Clinton County Airport, DeWitt, Ia.	Cruiser	Cont. 75	75 hr.	Never	1800
McBoyle Cub Sales, Airport, Lake Delton, Wis.	Cruiser	Lyc. 75	64 hr.	New	1795
Bay State Flying Service, Framingham Airport, Framingham, Mass.	J5 Cruiser	Cont. 75	75 hr.	Never	1750
J. L. Schroeder, Inc., Box 8055, Houston, Tex.	J4 '40	Cont. 65	93 hr.	None	1750
Southern Vt. Fly. Serv.,Arpt.,N. Springfield, Vt.	Cruiser	Cont. 75	40 hr.	New	1750
Bishop Flying Service, Inc., Bishop Airport, Flint, Michigan	Cruiser J5A	Cont. 75	126 hr.		1700
DuBois Aviation Association, Municipal Airport, DuBois, Pa.	Cruiser	Cont. 75	342 hr.	Never	$1695
Odessa Flying Serv., Odessa, Texas	Cruiser	Cont. A75-9	186 hr.	Just	1650
Zimmerly Brothers Air Transport, Box 266, Lewiston, Idaho	Cruiser	Cont. 75	485 hr.		1600
Fred Helm, Helms Airport, Zap, N. Dak.	J-5 Cruiser	Cont. 75	95 hr.	Never	1600
Rocky Mount Flying Service, Municipal Airport, Rocky Mount, N. C.	Cruiser J5	Cont. 75	240 hr.	None	1600
Herman L. Martin, Munic. Arpt., Walla Walla, Wash.	J4	Cont. 65	450 hr.	25 hr.	1600
Skelly's Flying Service, Greenville Airport, Greenville, Pa.	J6-C-75	Cont. 75	100 hr.	Never	1595
DuBois Aviation Association, Municipal Airport, DuBois, Pa.		Cont. 65	97 hr.		1595
Paul D. Eyster, Tri-State Airport, Angola, Indiana	J-5	Cont. 75	210 hr.	None	1590
Paris Flying Service, Municipal Airport, Paris, Texas	J-4A	Cont. 65	150 hr.	Never	1575
Racine Fly. Serv., Racine Arpt., Racine, Wisc.	J-4	Cont. 65	383 hr.	353 hr.	1575
Barr Aviation Corp., Detroit City Arpt., Detroit, Michigan	J4 Coupe	Cont. 65	175 hr.	None	1550
Southern Air Service, Memphis, Tenn.		Cont. 65	100 hr.	New	1550
Seidner Flying Service, S.A.M. Airport, Youngstown, Ohio	Cruiser J-5A		278 hr.		1550
Williams-Blood Aircraft Sales, Inc., Box 1212, Charleston, W. Va.	J3	Frnkln 65.	60 hr.	Never	1500
J. E. Badger, 1780 Green Rd., Sc. Euclid, Ohio	Coupe	Cont. 65	125 hr.	None	1500
St. Louis Flying Service, Lambert Field, Robertson, Mo.	Cruiser	Cont. 75	365 hr.	50 hr.	1500
E. H. Brockenbrough, Mun. Arpt., Charlotte, N. C.	J4 '40	Cont. 65	200 hr.	200 hr.	1500
Al Gillis Fly. Serv., 125 1st Ave., No., Great Falls, Mont.	Coupe '40	Cont. 65	350 hr.	None	1500
Desjardin Auto Serv., 24 Fairmount Ave., Worcester, Mass.	J-5	Cont. 75	100 hr.	New	1500
Des Moines Flying Service, Inc., Municipal Airport, Des Moines, Ia.	Coupe	Cont. 65	192 hr.	Just	1490
Susquehanna Air Service, Milton Airport, Milton, Pa.	J-4 Coupe	Lyc. 65	400 hr.	Never	1475
Racine Fly. Serv., Racine Arpt., Racine, Wis.	J-4	Lyc. 65	330 hr.	top 320	1475
Des Moines Flying Service, Inc., Municipal Airport, Des Moines, Ia.	Trainer	Frnkln. 65	200 hr.	None	1450
Richard F. Holladay, Box 147, Fredericksburg, Va.	Cruiser	Cont.	400 hr.		1450
J. L. Schroeder, Inc., Box 8055, Houston, Tex.	J3	Cont. 65	98 hr.	None	1440
Williams-Blood Aircraft Sales, Inc., Box 1212, Charleston, W. Va.	J3	Lyc. 65	200 hr.	Never	1400
Lexington Fly. Serv., Munic. Arpt., Lexington, Kentucky	J5	Cont. 75	230 hr.		1400
Reliable Fly.Serv.,P.O.Box 1303,Bristol, Conn.	J-4	Cont. 65	140 hr.	30 hr. fact.maj.	1400
Philadelphia Skyport, Inc., 4507 Marvine Ave., Drexel Hill, Pa.	Seaplane	Cont. 65	970 hr.	225 hr.	1390
J. L. Schroeder, Inc., Box 8055, Houston, Tex.	J3	Frnkln. 65	142 hr.	None	1375
Bay State Flying Service, Framingham Airport, Framingham, Mass.	J3	Lyc. 65	15 hr.	Never	1350
Harold W. Grucky, 1326 Walnut Street, Newton Highland, Mass.	J-3 Trainer	Lyc. 65	175 hr.	Never	1350
Bay State Flying Service, Framingham Airport, Framingham, Mass.	J3	Lyc. 65	15 hr.	Never	1350
Roy R. Taylor, Meacham Field, Fort Worth, Texas	Cruiser	Cont. 75	550 hr.	75 hr.	1350
Desjardin Air Service, 118 Heywood Street, Worcester, Mass.	J3	Lyc. 65	400 hr.	Never	1350
W. R. Franke, Shadwell, Va.	J4	Cont. 65	402 hr.	100 hr.	1350
Virginia Cub Distributors, Box 211, Farmville, Va.	J3	Lyc. 65	145 hr.		1350
Southern Vt. Fly. Serv., Arpt., Springfield, Vt	J3L '40	Lyc. 65	162 hr.	New	1350
TriCities Avia. Sch., TriCities Arpt., Endicott, N. Y.	J4 '39	Cont. 65	500 hr.		1300
Dethloff Flying Service, Euclid Avenue Airport, Willoughby, Ohio	J3	Frnkln. 65	230 hr.	None	1295
Williams-Blood AircraftSales, Inc., Box 1212, Charleston, W. Va.	J4	Cont. 65	350 hr.	150 hr.	1295
Martin and Phipps, 619 W. 7th St., Sioux City, Ia.	J-3	Frnkln. 60	110 hr.	Never	1275
J. L. Schroeder, Inc., Houston Main St. Arpt., Houston, Tex.	J-3 Trainer	Frnkln. 65	169 hr.	No	1275
Bay State Flying Service, Framingham Airport, Framingham, Mass.	J3	Lyc. 65	130 hr.	Never	1250
Pierce Flying Service, Municipal Airport, Ft. Wayne, Ind.	J4	Cont. 65	768 hr.	265 hr.	1250
Pierce Flying Service, Inc., Municipal Airport, Ft. Wayne, Ind.	Coupe	Cont. 65	754 hr.	390 hr.	1250
Southern Vt. Fly. Serv.,Arpt.,N. Springfield, Vt.	J3L '40	Lyc. 65	280 hr.	New	1250
Madison Fly. Serv., R. I., Madison, Ind.	J3L	Lyc. 65	205 hr.	No	1235
Richard F. Holladay, Box 147, Fredericksburg, Va.	Trainer	Frnkln. 65	369 hr.		1200
Mangen F. Warrington, Cub Fly. Serv., Selbyville, Del.	J3 '39	Cont. 55	40 hr.	No	1200
Desjardin Auto Serv., 24 Fairmount Ave., Worcester, Mass.	J-4 Dual	Cont. 65	550 hr.	400 hr.	1200
Galbraith Air Serv.,Munic. Arpt., Paducah, Ky.	J3L	Lyc. 65	102 hr.	No	1195
Philadelphia Skyport, Inc., 4507 Marvine Ave., Drexel Hill, Pa.	J-3	Cont. 65	455 hr.	202 hr.	1190

AUTHORIZED AIRCRAFT DEALERS

DEALERS	MODEL AND ENGINE		TIME	TIME SINCE OVER-HAUL	PRICE
Jerry C. Gendron, 220 E. Coolidge, Ironwood, Mich.	J3	Lyc. 65	300 hr.		$1175
Paul D. Eyster, Tri-State Airport, Angola, Indiana	J-3	Frnkln. 65	110 hr.	New	1150
Paul D. Eyster, Tri-State Airport, Angola, Ind.	J-3	Frnkln. 65	250 hr.	New	1125
Jesse Jones Air Service, Lancaster Municipal Airport, Lancaster, Pa.	Trainer	Frnkln. 65	240 hr.	Never	1100
Susquehanna Air Service, Milton Airport, Milton, Pa.	J-3	Lyc. 65	110 hr.	Never	1100
Aviation Serv., Inc., Box 408, Newport News, Va.	J3L	Lyc. 65	528 hr.	None	1100
McInnis Aviation Service, Inc., So. St. Paul Airport, So. St. Paul, Minn.	J3	Lyc. 65	1124 hr.	166 hr.	1075
Northern Air Service, Kent County Airport, Grand Rapids, Mich.	J-3L 65	Lyc. 65	750 hr.	15 hr.	1050
Frank Rensma, Box 441, Youngsville, Pa.	J-3	Lyc. 65	520 hr.		1050
Northern Air Service, Grand Rapids Airport, Grand Rapids, Mich.	J3L65	Lyc. 65	800 hr.	15 hr.	1050
Hanover Air Service, Hanover Airport, E. Hanover, N. J.	J-3-A	Cont. 65	7 hr.	Never	1050
Des Moines Flying Serv., Municipal Arpt., Des Moines, Ia.	J3	Frnkln. 65	500 hr.	None	1050
Gerald Gallagher, 4507 Marvine Ave., Drexel Hill, Pa.	J-3	Cont. 65	720 hr.	95 hr.	1050
J. L. Schroeder, Inc., Houston Main St. Arpt., Houston, Texas	J-3	Cont. 65	596 hr.	Yes	1050
Towners Fly. Serv., Towanda Arpt., Towanda, Pennsylvania	J-3-40	Lyc. 65	388 hr.	None	1050
Inter-City Fly.Serv.,Mun. Arpt.,Ft. Wayne, Ind.	J3 '40	Frnkln. 65	456 hr.		1050
Mount Hawley Flying Service, Box 626, Peoria, Ill.	J3	Frnkln. 65	172 hr.	Never	1025
Safair, Inc., Roosevelt Field, Mineola N. Y.	J3	Lyc. 65	885 hr.	38 hr.	1000
Safair, Inc., Roosevelt Field, Mineola, N. Y.	J3	Lyc. 65	860 hr.	Never	1000
Safair, Inc., Roosevelt Field, Mineola, N. Y.	J3	Lyc. 65	885 hr.	2 hr.	1000
Safair, Inc., Roosevelt Field, Mineola, N. Y.	J3	Frnkln. 60	510 hr.	Never	1000
Pierce Flying Service, Municipal Airport, Ft. Wayne, Ind.	J3C	Cont. 65	781 hr.	83 hr.	1000
Cedar Rapids Airways, Inc., Cedar Rapids, Ia.	J	Lyc. 65	650 hr.	100 hr.	1000
Zimmerly Brothers Air Transport, Box 266, Lewiston, Idaho		Cont. 50	1300 hr.	90 hr.	1000
Spann Fly. Serv., Mun. Arpt., Colorado Springs, Colo.	J4	Cont. 65	650 hr.	200 hr.	1000
Richmond Air Trans.,Byrd Arpt.,Richmond, Va.	J3	Frnkln. 60	530 hr.	215 hr.	1000
Midwest Avia. Corp.,Norton Fld.,Columbus, O.	Coupe	Frnkln. 60	600 hr.		1000
Stillwater Fly. Serv.,Box 466, Stillwater, Okla.	J3C	Cont. A-505	1073 hr.	N'w eng.	1000
L. L. Rupert, Box 446, Muskogee, Okla.	J3F '40	Frnkln. 50	150 hr.	like new	1000
Howard W. Grucky, 1326 Walnut Street, Newton Highlands, Mass.	J3	Lyc. 55	600 hr.	Just	995
Carpenter Air Serv., 217 S. Poplar, Wichita, Kansas	J-3	Lyc. 65	1190 hr.	Just	995
Susquehanna Air Serv., Milton Airport, Milton, Pa.	J3	Lyc. 65	350 hr.	Never	975
Ben C. Arquitt, Mun. Arpt., Lima, Ohio	J3	Frnkln. 60	314 hr.	272 hr.	970
Susquehanna Air Service, 439 Broad Street, Montoursville, Pa.	J3	Lyc. 65	335 hr.	None	950
Leonard J. Schrader, Nauvoo, Ill.	J3	Frnkln. 60	487 hr.	Never	950
W. Arnet Speer, 3330 Barnett, San Diego, Calif.	J3C	Cont. 50	1950 hr.	2 hr.	950
Consolidated Air Serv., Rubinkam Arpt., Harvey, Illinois	J3	Frnkln. 60	570 hr.	None	950
Herman L. Martin, Mun. Arpt., Walla Walla, Wash.	J3	Frnkln. 50	1100 hr.	50 hr.	950
Ray Wilson, Inc., Park Hill Arpt., Denver, Colo.	J-3	Frnkln. 50	850 hr.	mjr. 750 hrs.	950
G. L. Williams, Syracuse Arpt., Syracuse, N.Y.	J3	Frnkln. 60	998 hr.	Recent	925
Desjardin Air Service, 118 Heywood, Worcester, Mass.	J3	Lyc. 55	1200 hr.	400 hr.	900
Hanover Air Service, Hanover Airport, East Hanover, N. J.	J3L	Lyc. 55	5 hr.	Never	$900
Skelly's Flying Service, Greenville Airport, Greenville, Pa.	J3L65	Lyc. 65	800 hr.	Just	900
Russ Walling, Walling-Watertown Arpt., Watertown, N. Y.	J3	Frnkln. 50	925 hr.	500 hr.	900
Avia. Serv., Inc., Box 408, Newport News, Va.	J3L	Lyc. 55	550 hr.	None	900
Consolidated Air Serv., Rubinkam Arpt., Harvey, Illinois	J3	Frnkln. 60	720 hr.	None	900
Desjardin Auto Serv., 24 Fairmount Ave., Worcester, Mass.	J-3	Lyc. 55	900 hr.	700 hr.	900
Southern Air Serv., Memphis, Tenn.		Lyc. 50	300 hr.	New	900
Piedmont Aviation, Inc., Box 1941, Winston-Salem, N. C.	Trainer	Lyc. 65-Dual	842 hr.	348 hr.	895
Bennett Air Serv.,P.O.Box 247,Hightstown,N.J.	J3	Frnkln. 50	261 hr.	Just	895
White Fly. Serv., Inc., Caldwell Wright Arpt., Caldwell, N. J.	J3	Lyc. 50	1201 hr.	1/41 hr.	875
Lexington Fly. Serv., Inc., Lexington Arpt., Lexington, Ky.	J-3	Lyc. 55	1050 hr.	1000 hr.	875
Southern Arwys. Sales Co., Munic. Arpt., Birmingham, Alabama	J-3	Frnkln. 50	450 hr.	425 hr.	875
Dethloff Flying Service, Euclid Avenue Airport, Willoughby, Ohio	J3	Frnkln. 50	450 hr.	65 hr.	850
Mountain States Aviation, Inc., 3800 Dahlia St., Denver, Colo.		Cont. 65	1350 hr.	400 hr.	850
Alabama Air Service, Auburn-Opelika Airport, Auburn, Ala.	Trainer	Lyc. 65	691 hr.	691 hr.	850
White Fly. Serv., Inc., Caldwell Wright Arpt., Caldwell, N. J.	J3	Lyc. 50	1275 hr.	8/40	850
Midwest Avia. Corp., Norton Fld., Col., O.	J3F	Frnkln. 50	1080 hr.	2/41	850
McBoyle Cub Sales, Airport, Lake Delton, Wis.	J3	Frnkln. 50	630 hr.	200 hr.	845
McInnis Aviation Service, Inc., So. St. Paul Airport, So. St. Paul, Minn.	J-3 Sport	Frnkln. 50	735 hr.	204 hr.	800
James S. Campbell, Rolla, Mo.	Trainer	Frnkln. 50	600 hr.	Just	800
Avia. Serv., Inc., Box 408, Newport News, Va.	J3L	Lyc. 50	825 hr.	650 hr.	800
Jersey Flying Service, Inc., Oakland, N. J.	J3	Frnkln. 60	600 hr.	100 hr.	795
Fayette Arwys., Inc., Uniontown, Pa.	J-3	Lyc. 50	900 hr.	12/40	785
Smith Fly. Serv., Wilkes-Barre Wyoming Valley Arpt., Forty-Fort, Pa.	J-3	Cont. 50	1230 hr.	870 hr.	775
Skelly's Flying Service, Greenville Airport, Greenville, Pa.	J3L50	Lyc. 50	1000 hr.	Just	775
Susquehanna Air Service, 439 Broad Street, Montoursville, Pa.	J-3	Lyc. 50	450 hr.	None	775
Alabama Air Service, Auburn-Opelika Airport, Auburn, Ala.	Trainer	Lyc. 55	1489 hr.	400 hr.	775
Elliott Flying Service, Clinton County Airport, DeWitt, Iowa	J-3	Lyc. 50	1100 hr.	150 hr.	750
Regan Flying Service, Shawnee, Okla.	J3	Frnkln.	766 hr.	165 hr.	750
Skelly's Fly. Serv., Greenville Arpt., Greenville, Pa.	J-3	Lyc. 50	1100 hr.	Maj. Only	745
Jenkins Air Serv., Mun. Arpt., Rochester, N. Y.	J3 Trainer	Lyc. 50	1080 hr.	890 hr.	725
Zimmerly Brothers Air Transport, Box 266, Lewiston, Idaho	Trainer	Frnkln. 50	1600 hr.	150 hr.	700
Roy R. Taylor, Meacham Field, Fort Worth, Texas	Trainer	Lyc. 55	1100 hr.	150 hr.	700
Avia. Sales, Box 408, Newport News, Va.	J3L	Lyc. 50	1100 hr.	675 hr.	700
Wallace Aircraft Co., Clarcona, Fla.	J2	Cont. 40	700 hr.	May '41	695
Johnny Haralson, Air Trans. & Sales Co., Toney Field, Pine Bluff, Ark.	J-3	Cont. A-44	650 hr.	600 hr.	695
Oakland Arcft. Alameda, Calif.	J-2	Cont. 40	1785 hr.	May '40	665
Bay State Flying Service, Framingham Airport, Framingham, Mass.	J-3	Cont. 40	630 hr.	100 hr.	650
Shaw Aircraft Co., Mun. Arpt., Iowa City, Ia.	J3	Cont. 40	430 hr.	Never	650
Martin and Phipps, 619 W. 7th St., Sioux City, Iowa	Ja	Cont. 40		Just & Recov.	650
J. L. Schroeder, Inc., Houston Main St. Arpt., Houston, Texas	J-2 '36 Trainer	Cont. 40	647 hr.	Yes	650

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FLYING'S USED PLANE LISTING OF

DEALERS	MODEL AND ENGINE		TIME	TIME SINCE OVER-HAUL	PRICE
Lane Air Service, Albany, Ga.	J-2	Cont. 40	620 hr.	Just	$625
Pierce Flying Service, 2135 Broadway, Eureka, Calif.	J2	Cont. A-40	2050 hr.	110 hr.	600
H. G. Mayes, Box 2104, Huntington, W. Va.	J3	Cont. 50	780 hr.	243 hr.	600
Decatur Avia. Co., 776 S. Maffit St., Decatur, Illinois	J3C	Cont. 40	589 hr.	25 hr.	595
Seidner Fly. Serv., S.A.M. Arpt., Youngstown, Ohio	J-2	Cont. 40	396 hr.	90 hr.	579
Piedmont Avia., Munic. Arpt., Winston-Salem, N. C.	J-3	Cont. 40	516 hr.	201 hr.	575
John Ruzicka, Circus City Arpt., Peru, Indiana	J2	Cont. 40	550 hr.	50 hr.	575
Carver Flying School, Box 374, Fargo, N. D.	Trainer J2	Cont. 40		Just	550
J. E. Badger, 1780 Green Rd., So. Euclid, O.	J2	Cont. 40	550 hr.	Just	550
Lexington Fly. Serv., Mun. Arpt., Lexington, Ky.	J-2	Cont. A-40-5	825 hr.		550
Phillips Fly. Serv., Arpt., Mt. Pleasant, Mich.	J-2	Cont. 40	250 hr.		550
Piedmont Avia., Inc., Munic. Arpt., Winston-Salem, N. C.	J-2	Cont. 40	574 hr.	100 hr	525
Linn County Airways, 221 3rd St., N.E., Cedar Rapids, Iowa		Cont. 40	400 hr.	5 hr.	525
John Ruzicka, Circus City Airport, Peru, Ind.	J-2	Cont. 40	550 hr.	None	500
PITCAIRN					
Boulevard Airport, Inc., Roosevelt Boulevard, Philadelphia, Pa.	J67-240	Wright	345 hr.	Never	1695
John Ruzicka, Circus City Airport, Peru, Ind.	P-6	Wright J-5 220	1200 hr.	100 hr.	795
PORTERFIELD					
Aircraft Sales of Mich., Municipal Airport, Detroit, Mich.		LeBlond 70	465 hr.	200 hr.	875
Kenneth V. Benesh, Monticello, Ia.	35-70	LeBlond 70	700 hr.	300 hr.	695
REARWIN					
Aircraft Sales of Michigan, Municipal Airport, Detroit, Mich.	Cloudster	Ken Royce 120	20 hr.	Never	4500
Aero Sales Corp., 1008 First National Building, Birmingham, Ala.	Cloudster	Ken Royce 120	133 hr.	Never	4000
C. W. Peterson, Mun. Arpt., Salina, Kansas	Cloudster	KR 120	300 hr.	270 hr. Topped	3200
Aircraft Sales of Mich., Municipal Airport, Detroit, Michigan	Skyranger	Frnkln. 80	New	Never	2845
Aircraft Sales of Michigan, Municipal Airport, Detroit, Michigan	Skyranger	Frnkln. 80	New	Never	2700
Aircraft Sales of Michigan, Municipal Airport, Detroit, Michigan	Skyranger	Cont. 75	New	Never	2575
Aircraft Sales of Michigan, Detroit City Airport, Detroit, Michigan	Skyranger	Cont. 75	New	Never	2575
Howard A. Morey, Box 529, Madison, Wisc.	Cloudster	Ken Royce 120	329 hr.	None	2500
Aero Sales Corp., 1008 First Nat'l Bldg., Birmingham, Ala.	Skyranger	Frnkln. 80	30 hr.	Never	2200
Paris Fly. Serv., Mun. Arpt., Paris, Texas	Skyranger	Cont. 75	125 hr.		2100
M. H. Wall, P.O. Box 327, Willoughby, O.	Skyranger	Cont. 75	35 hr.		1935
Dewey Eldred Fly. Serv., Inc., Willoughby, O.	Skyranger	Cont. 75	40 hr.		1845
M. H. Wall, 1075 East 286th St., Wickliffe, O.	Skyranger	Cont. 75	45 hr.	45 hr.	1785
Aircraft Sales of Michigan, Municipal Airport, Detroit, Michigan	Sportster	LeBlond 70	170 hr.	Never	1500
N. L. Wallingford, 401 Ingalls, Cincinnati, O.	7000	LeBlond 70	400 hr.	80 hr.	1200
Jennings Bros., No. Grafton, Mass.		LeBlond 70	680 hr.	50 hr.	1075
E. W. Wiggins Airways, Inc., Boston, Met. Arpt., Norwood, Mass.	8500	LeBlond 85	802 hr.	111 hr.	975
Southern Arwys. of Danville, Box 205, Danville, Va.	1936	LeBlond 85	368 hr.	Never	975
Racine Fly. Serv., Racine Arpt., Racine, Wisc.	7000	LeBlond 70	536 hr.	510 hr.	850
RYAN					
Standard Fly. Serv., Inc., Somerset Hills Arpt., Basking Ridge, N. J.	STA	Menasco 125	190 hr.	150 hr.	3450
SIKORSKY					
Mount Hawley Flying Service, Box 626, Peoria, Illinois	Amphibian	PW 330	402 hr.	75 hr.	5950
STANDARD					
Becker Arcft. Sales, Bettis Arpt., Homestead, Pa.	D-25	J-5-225	500 hr.	150 hr.	1500
A. A. Knowles, Rt. 4, Boise, Ida.	New	Wright J 5 220	417 hr.	3/40	1000
STEARMAN					
Stinson Fly. Corp., San Francisco Mun. Arpt., S. San Francisco, Calif.	Hammond	Menasco 150	500 hr.	10/40	1500
Tacoma Fly. Service, Box 157, So. Tacoma, Wash.	C-3-B	Wright J-5 220	1800 hr.	Recently	800
STINSON					
Jenkins Air Service, Inc., Municipal Airport, Rochester, N. Y.	SR8B	Lyc. 245	492 hr.	75 hr.	5500
Thomas Oakes, 240 Belleville Ave., Bloomfield, N. J.	SR9BD	Lyc. 245	620 hr.	350 hr.	4500
Howard A. Morey, Box 529, Madison, Wisc.	SR5	Lyc. 245	947 hr.	433 hr.	$4000
W. Va. Air Service, Inc., County Airport Clarksburg, W. Va.	Voyager	Frnkln. 90	157 hr.		3895
Howard A. Morey, Box 529, Madison, Wisc.	105	Cont. 80	375 hr.	None	3500
Floyd Foren Flyers, Inc., Detroit City Airport, Detroit, Mich.	Voyager	Frnkln. 90	675 hr.	120 hr.	3400
H. M. Barnes, Lumberton, N. C.	SR-6	Lyc.	350 hr.	50 hr.	3200
Blevens Aircraft, Airport, Atlanta, Ga.	T.	Lucn. 65	Just	Just	3000
Air Serv., Inc., Bellanca Fld., New Castle, Del.	105	Cont. 80	101 hr.	2 hr.	2950
Oak Air Service, Bates Field, Mobile, Ala.	105	Cont. 80	215 hr.	Just	2850
Reliable Flying Service, Inc., Box 1303, Bristol, Conn.	105	Cont. 80	100 hr.		2800
Paul E. DePover, Marshall, Minn.	105	Cont. 80	80 hr.		2600
Jenkins Air Serv., Inc., Mun. Arpt., Rochester, N. Y.	105	Cont. 80	215 hr.		2550
Moline Fly. Serv., Mun. Arpt., Moline, Illinois.	SR-5A	Lyc. 245	850 hr.	760 hr.	2495
Jenkins Air Service, Inc., Municipal Airport, Rochester, N. Y.	105	Cont. 80	465 hr.	80 hr.	2400
Colo. Avia. Co., 426 U.S. Nat'l B.B., Denver, Colo.	105	Cont. 175	400 hr.	Yes	2150
Upton & Bowen, West Memphis, Ark.	105	Cont. 75	275 hr.	5 hr.	2000
Narragansett Avia. Serv., R. I. State Arpt., Hillsgrove, R. I.	SR 5	Lyc. 225	1350 hr.	10 hr.	1900
Barber's Flying Service, Municipal Airport, Pontiac, Michigan	105	Cont. 75	1048 hr.	150 hr.	1800
Leech Aircraft, Inc., Roosevelt Field, Hangar F, Mineola, N. Y.	105	Cont. 75	790 hr.	180 hr.	1750
Oak Air Service, Inc., Mobile Municipal Airport, Springhill, Alabama	SJR	Lyc. 215	1105 hr.		1450
Becker Aircraft Sales, Bettis, Arpt., Homestead, Pa.	SR	Lyc. 225	600 hr.	50 hr.	1350
Akron Airways, Arpt., Akron, Ohio	5R	Lyc.	850 hr.	350 hr.	1350
Cedar Rapids Airways, Inc., Box 183, Cedar Rapids, Iowa	SM8A	Lyc. 215	1235 hr.	Just recovered fct. mjr.	1195
Livingston Airways Corp., Chapman Fld., Waterloo, Iowa	SM-8A	Lyc. 215	930 hr.	900 hr.	1000
DuBois Avia. Assoc., Munic. Arpt., DuBois, Pa.	S	Lyc. 215	1053 hr.	347 hr.	950
Floyd Foren Flyers, Detroit City Airport, Detroit, Mich.	SM8A	Lyc. 215			900
Floyd Foren Flyers, Inc., Detroit City Airport, Detroit, Mich.	SM8A	Lyc. 215	1820 hr.	259 hr.	900
Flying Dutchman Air. Serv., Sometown Arpt., Philadelphia, Pa.	SM-8A	Lyc. 220	1474 hr.	30 hr.	875
Lane Aviation Corporation, Port Columbus, Columbus, Ohio	SR	Lyc. 220	937 hr.	Never	800
E. H. Brockenbrough, Munic. Arpt., Charlotte, N. C.	SM-8A	Lyc. 215	850 hr.	820 hr.	800
Piedmont Aviation, Inc., Municipal Airport, Winston-Salem, N. C.	SM8A	Lyc. 215	878 hr.	163 hr.	700
Becker Arcft. Sales, Bettis Arpt., Homestead, Pa.	SM-8A	Lyc. 215	700 hr.		700
Piedmont Aviation, Inc., Box 1941, Winston-Salem, N. C.	SM-8A	Lyc. 215	720 hr.	412 hr.	675
Leeward Avia., New Kensington, Pa.	SM-2	Warner 125	550 hr.	Yes	500
TAYLORCRAFT					
Inter-City Flying Service, Municipal Airport, Ft. Wayne, Ind.	'41 Deluxe	Cont. 65	100 hr.	Never	1850
Geo. A. Short, Walnut, Illinois	Deluxe BC 12	Cont. 65	115 hr.	Never	1825
Hubert & Dillon Air Serv., Box 177-S, Tacoma, Wash.	BL Del.	Lyc. 65 dual	200 hr.		1825
Tailorcraft Aviation Corp., Alliance, Ohio		Lyc. 65-dual	140 hr.	20 hr.	1800
Inter-City Flying Service, Inc., Municipal Airport, Ft. Wayne, Ind.		Cont. 65	150 hr.	Never	1750
Wichita Falls Air Transp. Co., Box 84, Munic. Arpt., Wichita Falls, Tex.	BL-65	Lyc. 65	New	New	1750
Springfield Avia. Co., Munic. Arpt., Springfield, Ill.	BC-65	Cont. 65	195 hr.	None	1750
Tuscarawas Co. Aviation, Inc., Municipal Airport, New Philadelphia, Ohio	BL	Lyc. 65	353 hr.	Never	1695
Washington Pk. Arpt., Homewood, Ill.		Cont. 65	150 hr.	None	1650
Lynchburg Air Trans. and Sales Corp., Preston Glenn Airport, Lynchburg, Va.		Cont. 40	400 hr.	Top-160	1650
Palmyra Arpt., 817 Lincoln Ave., Palmyra, N. J.	BL	Lyc. 65	138 hr.	Never	1625
Jesse Jones Air Service, Lancaster Municipal Airport, Lancaster, Pa.	BL	Lyc. 65	190 hr.	Never	1600
Dufort School of Aeronautics, Massena, N. Y.	BC	Cont. 65	491 hr.	32 hr.	1600
Moline Fly. Serv., Munic. Arpt., Moline, Ill.	Deluxe BC	Cont. 65	950 hr.	Maj.now Motor topped	1600
Hubert & Dillon Air Serv., Box 177S, Tacoma, Wash.	BC	Cont. 65	450 hr.		1525
Roch. Aeron. Corp., Roch. Arpt., Roch., N. Y.	BL-65	Lyc. 65	80 hr.		1525
Walter D. Mauk, Blackwell, Okla.		Lyc. 65	400 hr.	None	1500
Fred J. Mohr, Fessenden, N. D.	Deluxe '41	Cont. 65	70 hr.	Never	1500
Narragansett Avia. Serv., R. I. State Arpt., Hillsgrove, R. I.	BL-40	Lyc. 65	254 hr.	Will be	1495
Les C. Myers, Rapid City, S. Dak.		Cont. 65	187 hr.	Never	1475
C. R. Galloway, 707 W. Groud, Ponca City, Oklahoma	BC	Cont. 65	600 hr.	35 hr.	1450
Ranger Fly. Serv., Ranger, Texas	BL-65	Lyc 55	140 hr.	140 hr.	1450
Rochester Aeronautical Corp., Rochester Arpt., Rochester, N. Y.	BL-65	Lyc. 65	470 hr.		1450

AUTHORIZED AIRCRAFT DEALERS

DEALERS	MODEL AND ENGINE		TIME	TIME SINCE OVER-HAUL	PRICE
Moline Fly. Serv., Munic. Arpt., Moline, Ill.	DeLuxe BL	Lyc. 65	675 hr.	None	$1400
Palmyra Arpt.,817 Lincoln Ave.,Palmyra, N. J.	BL	Lyc. 65	318 hr.	Never	1400
Ranger Fly. Serv., Munic. Arpt., Ranger, Texas	BL-65	Lyc. 55 dual	170 hr.	170 hr.	1395
Washington Park Arpt., Inc., Homewood, Ill.		Lyc. 50	85 hr.	None	1390
Dawson Air Serv., Box 852, Salina, Kans.	DeLuxe BL	Lyc. 65	840 hr.	Just	1350
Ranger Fly. Serv., Ranger, Texas	BL-55	Lyc. 55	180 hr.	180 hr.	1350
Inter-City Fly., Munic. Arpt., Ft. Wayne, Ind.	BL '40	Lyc. 50	326 hr.		1325
Lane Avia. Serv., Pt. Columbus, Columbus, O.		Lyc. 65	428 hr.	Never	1300
Walter D. Mauk, Municipal Airport, Blackwell, Okla.		Lyc.	600 hr.	n'w eng.	1300
Greenville Sch. Avia., Treaty City Arpt., Greenville, Ohio	BL	Lyc. 65	265 hr.	None	1300
Hopewell Fly. Serv., Hopewell Arpt., Hopewell, Va.	BL-65	Lyc. 65	375 hr.	9/40	1300
Earl J. Howard, P.O. Box 565, Ames, Iowa	BLT	Lyc. 65	510 hr.	None	1200
Roscoe Turner Aeronautical Corp., Indianapolis, Ind	BBC	Cont. 65	580 hr.	Never	1250
J. E. Badger, 1780 Green Rd., S. Euclid, O.		Cont. A-65	340 hr.	Top-300	1250
Tuscarawas Co. Aviation, Inc., Munic. Arpt., New Philadelphia, Ohio	BL	Lyc. 65	1066 hr.	Just	1245
J. E. Badger, 1780 Green Rd., So. Euclid, Ohio	FTB	Cont. A65	410 hr.	20-top	1200
Marlboro Airport, Inc., Farm Road, Marlboro, Mass.	Trainer	Lyc. 55-dual	772 hr.	142 hr.	1200
Reliable Fly. Serv., Inc., Bristol, Conn.	BL 65	Lyc. 65	864 hr.	864 hr.	1200
Rochester Aeron. Corp., Rochester Arpt., Rochester, N. Y.	BL-55	Lyc. 55	500 hr.	None	1200
Tuscarawas County Aviation, Inc., Municipal Airport, New Philadelphia, Ohio	BL	Lyc. 65	1203 hr.	599 hr.	1195
C. W. Peterson, Munic. Arpt., Salina, Kans.	BLT-65	Lyc. 65	290 hr.	Never	1195
Boyd Mote, Denman Ave., Coshocton, Ohio	BL-50	Lyc. 50	105 hr.	New 1940	1195
Roscoe Turner Aeronautical Corporation, Indianapolis, Ind	BC	Cont. 65	590 hr.	Never	1175
Dufort Sch. Aero., 57 Ft. Covington St., Malone, N. Y.	BT	Lyc. 55	395 hr.	New 5/40	1175
Clinch Flying Service, Municipal Airport, North Platte, Nebraska	BL	Lyc. 50	950 hr.	100 hr.	1150
Lane Aviation Corporation, Port Columbus, Columbus, Ohio	DL 65	Lyc. 65	700 hr.	Never	1100
Dufort School of Aeronautics, Massena, N. Y.	BLT	Lyc. 55	805 hr.	231 hr.	1100
Harry C. Phillips, Phillips Flying Service, Mt. Pleasant, Mich.	BLT	Lyc. 50	500 hr.	Never	1100
Palmyra Arpt., 817 Lincoln Ave., Palmyra, N. J.	BLT	Lyc. 50	373 hr.	83 hr.	1100
Dewey Eldred Fly. Serv., Lost Nation Arpt., Willoughby, Ohio	BL-65	Lyc. 65	831 hr.	Ship 11/40	1100
B. F. Spanamore, 710 5th Street, Dodge City, Kansas	Trainer	Lyc. 55-dual	880 hr.	130 hr.	1050
Duane L. Huscher, Box 65, Lawton, Okla.	BF	Frnkln. 50	1302 hr.	197 hr.	1050
Decatur Avia. Co., 776 S. Maffit St., Decatur, Illinois	BL	Lyc. 50	570 hr.	No	1050
Ryan Air Serv., Decorah, Iowa	Late '39	Lyc. 50	770 hr.	350 hr.	1050
Wichita Falls Air. Transp. Co., Box 84, Munic. Arpt., Wichita Falls, Texas	BLT-55	Lyc. 55	400 hr.	Since 50 hr.	1050
Phillips Fly. Serv., Arpt., Mt. Pleasant, Mich.	BL-50	Lyc. 50	1100 hr.	900 hr.	1050
Merrill Hale, Hillsgrove, R. I.		Frnkln. 50	268 hr.	35 hr.	1050
Hyannis Airport Corporation, Box 592, Hyannis, Mass.	BLT	Lyc. 55	1170 hr.	225 hr.	1000
Indiana Air Serv.,Bendix Fld.,South Bend, Ind.	BL	Lyc. 55	1038 hr.		1000
Louis A. Musgrove, Box 814, Morgantown, W. Va.	BL	Lyc. 50	725 hr.	150 hr.	1000
Canton Aviation Co., Martin Field, Canton, O.	BLT	Lyc. 65	1000 hr.	200 hr.	995
Canton Aviation Co., Martin Field, Canton, O.	BLT	Lyc. 65	950 hr	100 hr.	995
Narragansett Avia. Serv., R. I. State Arpt. Hillsgrove, R. I.	BF	Frnkln. 50	351 hr.	130 hr. Since	995
J. W. Hunt, 636 N. Livinstone St., Lexington, Kentucky		Cont. 65	525 hr.	25 hr.	950
Schneider Aero. Serv., Chandler Fld., Fresno, Calif.	BC	Cont. 50	1216 hr.	106 hr.	950
St. Louis Flying Service, Lambert Field, Robertson, Mo.	BL50	Lyc. 50	1148 hr.	Recently	945
Walter D. Mauk, Municipal Airport, Blackwell, Okla.		Cont. 50	782 hr.	150 hr.	900
Indiana Air Serv., Bendix Fld., South Bend, Indiana	BL	Lyc. 50	970 hr.		900
Jesse Jones Air Service, Lancaster Municipal Airport, Lancaster, Pa.	BLT	Lyc. 55	450 hr.	125 hr.	875
Piedmont Avia., Munic. Arpt., Winston-Salem, N. C.	'39	Frnkln. 50	563 hr.	164 hr.	825
Hyannis Airport Corporation, Box 592, Hyannis, Mass.	BL	Lyc. 50	960 hr.	250 hr.	800

DEALERS	MODEL AND ENGINE		TIME	TIME SINCE OVER-HAUL	PRICE
Dufort School of Aeronautics, Massena, N. Y.	BF	Frnkln. 50	790 hr.	19 hr.	$775
Duane L. Huscher, Box 65, Lawton, Okla.	A	Cont. A40-4	600 hr.	75 hr.	725
Hume Flying Service, Box 515, Arkansas City, Kansas	A	Cont. A40-4	1043 hr.	Just	700
Carnahan Fly. Serv., Bloomington, Ill.		Cont. 40	507 hr.	100 hr.	700
Niederhauser Airways, 104 South 5th St., Marshalltown, Ia.	A	Cont. 40	710 hr.	280 hr	695
Merrill Hale, Hillsgrove, R. I.		Cont. 40	1081 hr.	100 hr.	695
Virginia Cub Distributors, Box 211, Farmville, Va.		Cont. 40	500 hr.	Just	670
Lynchburg Air Transport & Sales, Preston Glenn Airport, Lynchburg, Va.	'38	Cont. 40	415 hr.	Never	650
Cedar Rapids Airways, Inc., Box 183, Cedar Rapids, Iowa		Cont. 40	1006 hr.	Just	650
Springfield Avia. Co.,Munic. Arpt.,Sprgfld.,Ill.		Cont. A-40-4	375 hr.	None	650
J. L. Wells, 106 W. Main, Avon Park, Fla.		Cont. 40	690 hr.	100 hr.	650
E. H. Brockenbrough, Munic. Arpt., Charlotte, N. C.	A	Cont. 40	550 hr.	520 hr.	600
Canton Aviation Co., Martin Field, Canton, O.		Cont. 40	420 hr.	30 hr.	525
W. Arnet Speer, 2830 Pacific, San Diego, Calif.	16E	Wright 175	1000 hr.	85 hr.	2500
TRAVELAIR					
Falcon Arcft. Corp., L. A. Munic. Arpt., Inglewood, Calif.	Osprey	Wright 250	814 hr.	80 hr.	2500
Northeast Airways, Inc., Portland City Arpt., Portland, Maine	Trainer '40	Lyc. 55	591 hr.	91 hr.	1250
Indiana Air Serv., Inc., Bendix Fld., So. Bend, Indiana	4000	Wright J-5, 220	940 hr.	7/40	1200
Aviation Service Company, Inc., Box 32, Hartford, Conn.	BL	Lyc. 55	324 hr.	No	1200
Louis A. Musgrove, Airport, Elkins, W. Va.	BL-T	Lyc. 65	600 hr.	200 hr.	1200
H. E. Oliver, 63 Orchard St., Pittsfield, Mass.	BL	Lyc. 55	450 hr.	Top 400 hr.	1200
Lynchburg Air Transport and Sales, Preston Glenn Airport, Lynchburg, Va.	4000	Wright J5A	350 hr.	30 hr.	1100
Cedar Rapids Arwys., Inc., Cedar Rapids, Ia.	4000	Wright J65	12 hr.	Since	1050
Shaw Arcft. Co., Munic. Arpt., Iowa City, Ia.	4000	J-5 220	1401 hr.	511 hr.	1000
C. W. Peterson, Munic. Arpt., Salina, Kans.	C-4000	Chall. 185	600 hr.	Topped 12 hr.	1000
Oak Air Serv., Inc., Bates Field, Mobile, Ala.	E4000	Wright J65	1140 hr.	Just	985
Oak Air Service, Inc., Mobile Municipal Airport, Springhill, Ala.	E4000	Wright J-6-5	1142 hr.		950
McInnis Aviation Service, Inc., McInnis So. St. Paul Airport, So. St. Paul, Minn.	B4000	Wright J5	1712 hr.	102 hr.	895
Leeward Aviation, Vandergraft Airport, New Kensington, Pa.	4000	Challenger 185	700 hr.	16 hr.	750
Leeward Avia., New Kensington, Pa.		Chall. 185	700 hr.	Yes	745
Kenneth V. Benesh, Monticello, Ia.	W4000	Warner 125	1600 hr.	50 hr.	600
VERVILLE					
Oak Air Service, Inc., Mobile Municipal Airport, Springhill, Alabama	AT31	Cont. 165	394 hr.	Just	900
WACO					
W. Arnet Speer, 2830 Pacific, San Diego, Calif.	UPF 7	Cont. 220	1200 hr.	175 hr.	4750
Walter D. Mauk, Municipal Airport, Blackwell, Okla.	YKS-6	Jacobs 225	450 hr.	50 hr.	3500
Pierce Flying Service, Box 894, Eureka, Calif.	YKC-S	Jacobs 225	633 hr.	40 hr.	3150
Safair, Inc., Roosevelt Field, Mineola, N. Y.	YMF	Jacobs 225	1330 hr.	20 hr.	2995
Merrill R. Hale, Tri-Cities Airport, Endicott, N. Y.	UKC-S	Cont. 210	700 hr.	Never	2500
Barber's Flying Service, Municipal Airport, Pontiac, Mich.	YKS	Jacobs 225	592 hr.	10 hr.	2500
Howard G. Mayes, Box 2104, Huntington, W. Va.	Custom	Jacobs 225	834 hr.	35 hr.	2500
Roy R. Taylor, Meacham Field, Fort Worth, Texas	F	Warner 125	575 hr.	Just	2250
Harold W. Gruchy, 1326 Walnut Street, Newton Highlands, Mass.	UIC	Cont. 210	650 hr.	Just	1600
Leeward Aviation, Vandergraft Airport, New Kensington, Pa.	UIC	Cont. 210	800 hr.	180 hr.	1295
Pierce Flying Service, Municipal Airport, Ft. Wayne, Ind.	RNF	Warner 125	902 hr.	288 hr.	1250
J. C. Gendron, 220 E. Coolidge, Ironwood, Michigan	RNF	Warner 125	1100 hr.	300 hr.	975

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1940 Luscombe 8A, Cont. 65, dual ignition, brakes, tail wheel, compass, radio antenna, sound proofed, blue stripe, $1385. Arents Air Service, Inc., Westchester Airport, Armonk Village, New York.

LUSCOMBE 8A Cont. 65. New December 1940, dual ignition, brakes, parking brake, compass, tail wheel, radio antenna, $1575. Arents Air Service, Inc., Westchester Airport, Armonk Village, New York.

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STINSON 105 80 Cont. 370 Hrs. A-1 Condition. New August, 1940. Licensed until August, 1942. Two-way radio. No time since complete major. Sacrifice $2000 or will trade for 41 Sedan. Fred Eaton, 271 Seventh St., San Francisco.

STINSON Voyager: 90 Franklin, Starter, lights, RCA receiver, yellow blue trim, perfect condition, 200 hours, $3,950.00. Clyde E. Williams, Jr., 724 Cooper Building, Denver, Colorado.

Miscellaneous

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(*Continued from page* 106)

retirement and back to his superchargers.

At the age of 69, as a consulting engineer, he is now helping a galaxy of production experts to turn out the equipment, secret as to the latest models, on a mass basis. Orders and production have increased astronomically. The General Electric River Works at Lynn, Mass., where Dr. Moss and four other men once turned out the country's entire supercharger production have been greatly enlarged. Production has already started on a new $5,000,000 plant for this purpose at Everett, Mass., and General Electric is now starting work on a third $20,000,000 supercharger plant at Fort Wayne, Ind.

All of which is a matter of quiet pride to bright-eyed Dr. Moss.

"First they told me it couldn't be done," he explains. "Then they said, 'What's the good of it?' And now what do they say? They say, 'we were going to do it all the time'."

No account of Dr. Moss would be complete without something about his hobbies. Among the things presented to him at a dinner on his "retirement" were a score of new 25-cent pieces as material for his "matching" hobby. In the interest of proving the law of probabilities, he has been matching quarters with his friends for many years. He insists that this is not gambling as, in the long run, he will come out even.

Genealogical research is one of his interests. He has prepared family trees of many of his own and his family's ancestral lines by ferreting out scores of distant relatives.

Dr. Moss is also well known in New England for his encounters with traffic officers in the suburbs of Boston. He once attempted to show by mathematical calculations that a policeman could not have overtaken him in such a short distance if he had been going as fast as charged. The judge listened and said: "Have you any more to say? It has cost you $5 so far."

Dr. Moss said no more. At another time, he gave his driver's license to an officer in the middle of the highway as required and then refused to pull over to the side as directed, on the ground that Massachusetts law forbids operation of a car without an operator's license and the officer had his license!

END

Airy Chat

(*Continued from page* 4)

One of the primary functions of an enemy agent is to learn the whereabouts of our military units. By checking against previous records—which were freely released prior to the declaration of war—it is a simple matter to determine within general limits just what movements have been made.

Let this be a friendly warning to our readers in the Army and Navy; *please think twice before you write your return address either on your envelop or the letter itself.* If there is the slightest doubt in your mind as to whether or not it is a safe procedure, ask your commanding officer. This is one vitally important way in which you can help protect not only yourself but the rest of the country.

* * *

IF there is anything in that old bromide "where there's smoke there's fire", you'll probably find the most conclusive proof of that fact on page 41. Cy Caldwell, who is aviation's smoke-eater par excellence, joins our band wagon this month for what we are sure will be a long and merry ride.

It's always been our secret ambition to be able to get our thoughts down on paper as pungently as Cy does. Whenever he sets out to tell a story you can be sure you're going to hear that story like it's never been told. And when there's something to be aired out he's the best laundry man in the aviation industry. We're tickled over the prospect of having a bona fide Caldwell punch in every issue from now on. Naturally, we'd like to know what you think too.

* * *

Write, wire or phone. MAX KARANT.

END

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Apr. 23-25 — Women's National Aeronautical Association. Annual convention at Hotel Phillips, Kansas City, Mo.

May 1-2 — Third New England Aviation conference, at Providence, R. I.

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CELESTIAL AIR NAVIGATION—This important field of Aviation has developed rapidly during the past year. Since the beginning of the second world war it has been apparent to the government that a critical shortage of air navigators existed. Immediately after December 7th, 1941, marking the actual beginning of the world war for the United States, the government began to survey the field and draw on navigation schools for air navigators and instructors. Airlines established Transition Schools for the purpose of practical advanced training. Former students of "Pan American College of Celestial Air Navigation" are now in various quarters of the world. Some are ferrying bombers to England and allied countries; others are instructing in the Army Air Corps or with Transition Schools for advanced training. Never before has navigation of the air offered such opportunities as the present.

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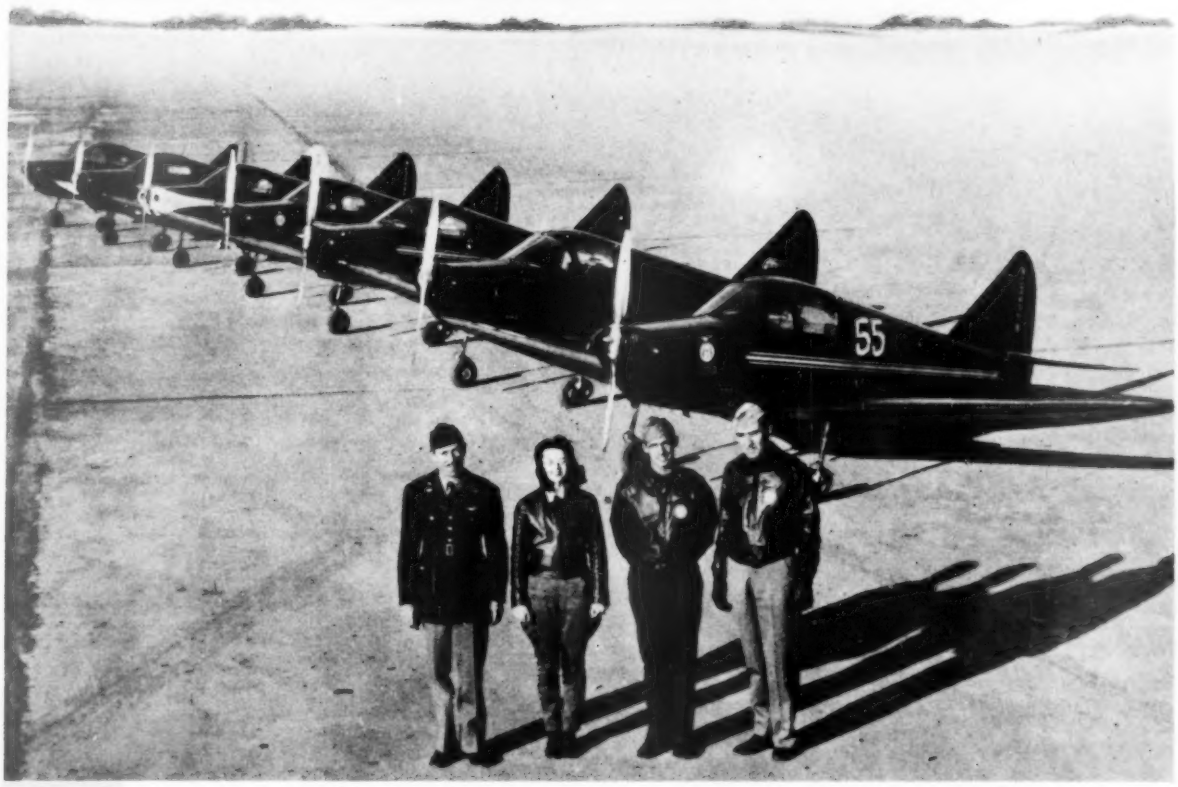

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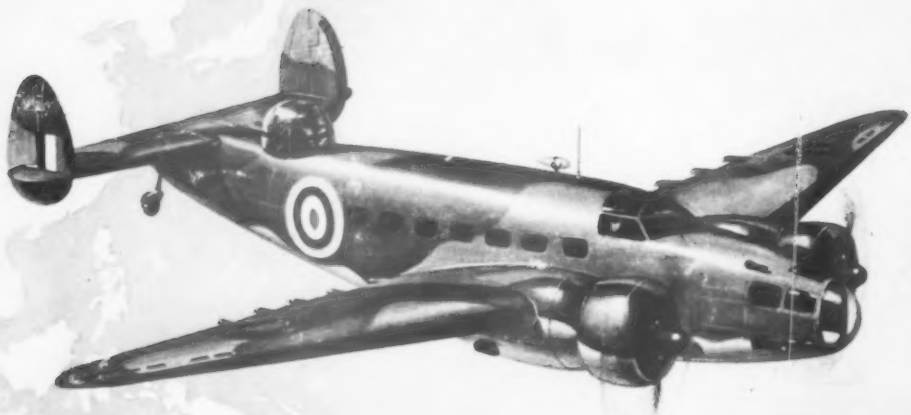

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